Session X Agenda

I. Status Update & Stakeholder Feedback – **30 minutes**
- DESC IRP Process & Schedule Update
- Review of Stakeholder Homework From Session IX

II. Study Results
- 2023 DSM Potential Study – **40 minutes**
- 2023 EV Study – **40 minutes**
- 2023 Planning Reserve Margin/ELCC Study – **40 minutes**

<Break>

III. 2023 IRP Inputs – **45 minutes**
- New Legislation
- Peak Demand and Energy Forecast
- Load Forecast Scenarios
- Commodity Fuel Price Inputs
- New Resources
- Candidate Resource Options

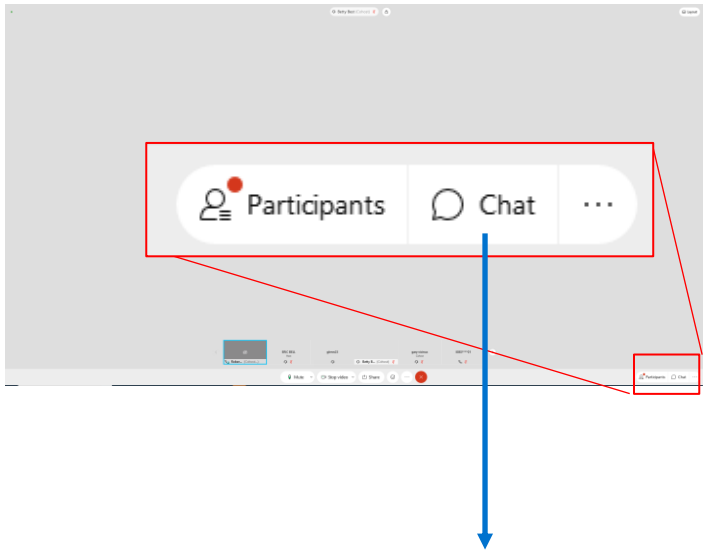
IV. Transmission Impact Analysis – **15 minutes**

V. Planning for Session XI and Next Steps – **15 minutes**
- Plans for Session XI
- Session X Homework

Q&A

- Microphones will be muted during presentations; we will open them when addressing questions at end of each section
- During presentations, questions can be submitted via the chat function
  - Only questions submitted in writing will be answered during live Working Group Sessions
- Each questioner will be allowed one follow-up question before they yield the floor to the next questioner
  - Please don't ask multiple questions in one question
  - If time permits and all questioners are answered, we will come back for additional questions
- All Q&As will be responded to in writing and placed on the web page:
  - https://www.DESC-IRP-Stakeholder-Group.com

Look for the chat function in the bottom right hand corner of the WebEx screen



Please type questions into the group chat

DESC IRP Stakeholder Advisory Group Meeting #10

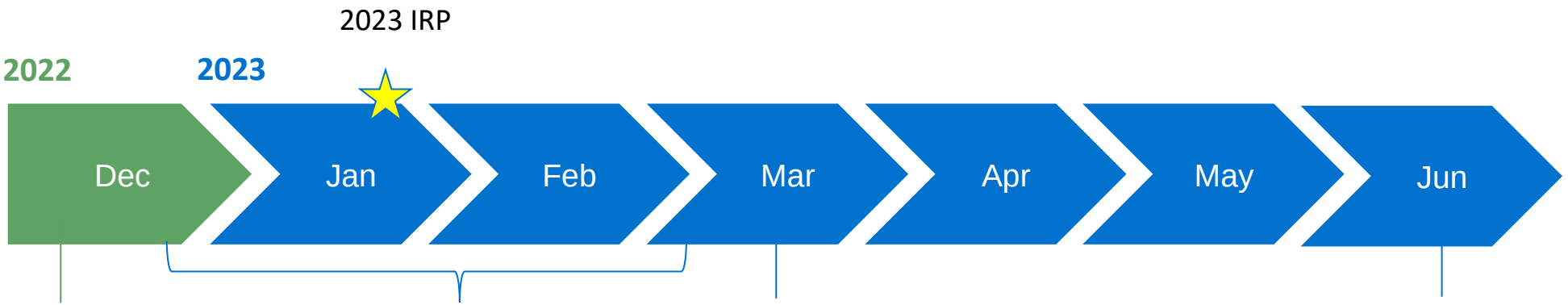
I. Status Update & Stakeholder Feedback

Dominion Energy®

Status Update & Stakeholder Feedback

- DESC IRP Process & Schedule Update
- Review of Stakeholder Homework From Session IX
- *Discussion*

DESC IRP Process & Schedule Update



Session X
- Report on Stakeholder Feedback
- 2023 DSM PS, EV, and RM/ELCC Study
- 2023 IRP Inputs
- Transmission Impact Analysis

2022 IRP Update Procedural Schedule
- 12/19/2022 – 3/6/2023

Session XI
- Report on Stakeholder Feedback
- 2023 IRP Key Takeaways and modeling results
- Identify short- and long-term goals for future stakeholder engagement

Session XII
- Stakeholder engagement on short- and long-term goals

Session IX Homework

General Feedback

1. What topics should DESC add to the agenda at Session X or as part of a future Stakeholder Session?

2022 IRP Update Continued

2. Are there additional aspects from the 2022 IRP Update that should be considered in future IRPs or Updates?

2023 IRP

3. DESC recommends in its 2022 Update conducting three Stakeholder Advisory meetings per year in 2023 and 2024. Do you agree with DESC's stakeholder engagement plan?

1. Agenda Feedback: Topics to address at future sessions.

Stakeholder Comments	Response / Action Taken
We would like an update on: i. The TIA ii. CT and new CT installation plan iii. Capacity RFP iv. The PLEXOS benchmarking study	The most recent, and still current, updates on the first three topics are included in the 2022 IRP Update. PLEXOS benchmarking report will be provided no later than February 28, 2023. DESC will add these topics to future sessions as requested and if new information is available.
A discussion on Solar plus Storage modeling approach for 2023 IRP is requested.	Solar and Storage will be modeled separately in the 2023 IRP and will be discussed during Session X.

1. Agenda Feedback: Topics to address at future sessions.

Stakeholder Comments	Response / Action Taken
It remains unclear how DESC is intending to incorporate many of the provisions of the IRA into the 2023 IRP, including tax incentives, tax credit multipliers for energy communities, and adjustments to the load forecast.	DESC will model assumptions in PLEXOS around the IRA's extension of PTCs and ITCs on non-emitting resources. Modeling will be discussed during Session X. As more information becomes available, we will look to incorporate additional aspects of the IRA in the modeling of DESC's 2024 IRP Update.
For the 2023 IRP, we would like to see DESC include the Inflation Reduction Act ("IRA") tax incentives, including labor multipliers and bonus credits, and assume the ability to transfer those credits to the extent DESC may not be able to use them.	See answer above.

1. Agenda Feedback: Topics to address at future sessions.

Stakeholder Comments	Response / Action Taken
We would appreciate the opportunity to have more detailed preliminary discussions of the PRM and ELCC study's substance before it is finalized. Topics we seek to discuss include the scenarios to be evaluated, modeling approach, assumptions, discussion on marginal vs. average ELCC, and preliminary results (if available).	The 2023 Planning Reserve Margin/ELCC Study is nearing completion on an aggressive timeline. Astrape will provide the results of the study during Session X and will be available to respond to specific questions on the topics listed in the comments.

1. Agenda Feedback: Topics to address at future sessions.

Stakeholder Comments	Response / Action Taken
If available, we would appreciate a discussion on any updated results of the Phase 2 TIA Assessment.	DESC intends to provide a status update on the 2022 TIA during Session X.
We would appreciate if Session X dedicates time to outlining and discussing any changes that DESC made to the modeling since the 2022 IRP Update including but not limited to, updated assumptions, inputs, modeling approach, etc.	DESC intends to discuss changes to modeling (i.e., incorporation of various study results, updates to modeling inputs, etc.) during Session X.

1. Agenda Feedback: Topics to address at future sessions.

Stakeholder Comments	Response / Action Taken
To the extent DESC sets its build constraints so that capacity needs in any year cannot be met without thermal generation, Joint Commenters ask that DESC explain the reason for those constraints in the 2023 IRP modeling. We also request that DESC provide all documentation or data supporting annual resource build constraints to stakeholders as soon as possible and ahead of Stakeholder Advisory Group Session X.	The annual build constraint on PV solar does not impact the thermal build. At a low ELCC, PV solar will not contribute appreciably to the winter reserve margin requirement. Battery builds are unconstrained. Batteries could offset thermal builds to an extent. This combination of renewable resource attributes, not constraints, is requiring the build of thermal resources. Solar is selected for its energy value, but some maximum build rate, 300 MW per year, is a reasonable annual build limit on a system like DESCs. DESC plans to maintain an annual constraint or limit tranches in proportion to the annual constraint. We will be providing inputs to the IRP Stakeholder Advisory Group once finalized.

1. Agenda Feedback: Topics to address at future sessions.

Stakeholder Comments	Response / Action Taken
We request DESC release the data and input assumptions for the 2023 IRP as soon as possible, and ahead of Stakeholder Advisory Group Session X. Session X will be held in December 2022 and the 2023 IRP is anticipated to be filed in early 2023. Stakeholders will have limited time to review and provide feedback to DESC about the changes in its input and modeling assumptions, and DESC will have limited time to incorporate these assumptions.	DESC seeks to timely provide updates to the IRP Stakeholder Advisory Group regarding all modeling input assumptions. DESC will provide the interim inputs to the PLEXOS models in advance of Session X or shortly after (as mentioned previously). As stated in the 2022 IRP Update and due to the Commission's procedural schedule (i.e., the short time between the filing of the 2022 IRP Update and the 2023 IRP), DESC would not be able to incorporate comments in the 2023 IRP. We also recognize that the 2023 IRP proceedings will provide stakeholders the opportunity to raise any matters that cannot be properly considered in the preparation of the 2023 IRP.

1. Agenda Feedback: Topics to address at future sessions.

Stakeholder Comments	Response / Action Taken
Since DESC is exploring changes to its 2026 portfolio in the 2023 IRP but is not planning to test different portfolios for their ability to meet the reliability criterion, it should identify key data informing the loss of load events identified in the modeling. An example of these data come from the GridPathRA Toolkit, recently released by GridLab. In general, we strongly recommend the GridLab study and its methodology to make LOLE study results more detailed and useful, including its weather-synchronized simulations, to improve DESC's resource adequacy studies going forward.	DESC will be using the PSC directed methodology in the Planning Reserve Margin/ELCC Study. The SERVM model is being used and Astrape's LOLE study does show when loss of load events occur and uses weather synchronized simulations. This key data will be provided as part of the results of the study.

2. Additional aspects to consider from 2022 IRP Update?

Stakeholder Comments	Response / Action Taken
At this time, we have not yet completed a thorough review of the 2022 IRP Update to provide comprehensive feedback. We have provided comments in previous stakeholder sessions prior to the filing of the 2022 IRP Update and will be providing additional comments pursuant to the procedural schedule established in Docket No. 2022-9-E.	DESC appreciates continued participation in the IRP Stakeholder Advisory Group. Additional comments made pursuant to the procedural schedule established in Docket No. 2022-9-E (Other Parties of Record due January 19, 2023) can be discussed during one or more of the ongoing stakeholder meetings envisioned during 2023.

2. Additional aspects to consider from 2022 IRP Update?

Stakeholder Comments	Response / Action Taken
We request that DESC loosen renewable and storage build constraints so that those constraints are non-binding and also permit the model to select a sufficient quantity of those options/resources to meet the reserve margin requirements.	DESC sets annual build constraints for solar and will respond to any questions regarding those constraints during Session X. It is not appropriate to remove all constraints due to the feasibility of the number of projects for similar resources to be completed in one year. Reasonable constraints were used to allow the model to provide solutions.
DESC appears to be continuing to assume that gas capacity would replace the Wateree and Williams units rather than fully exploring non-thermal generation as an alternative. In order for non-thermal generation to replace those units, DESC would need to relax its constraints on new builds and allow more storage of longer durations as a new resource option.	As mentioned earlier, the annual build constraint on PV solar does not impact the thermal build. At a low ELCC, PV solar will not contribute appreciably to the winter reserve margin requirement. Battery builds are unconstrained. Batteries could offset thermal builds but are not usually selected in the optimization. This combination of renewable resource attributes, not constraints, is requiring the build of thermal resources.

2. Additional aspects to consider from 2022 IRP Update?

Stakeholder Comments	Response / Action Taken
We acknowledge that the Commission ordered DESC to use a publicly available forecast for IRP modeling. While the full AEO Outlook will not be published until after the 2023 IRP is filed, the AEO short-term forecast is updated monthly, and could provide the 2023 IRP with more recent data of the market's expectation of forward gas prices. Additionally, DESC should perform a late-filed run when the full AEO 2023 forecast is released in March of 2023.	EIA publishes the AEO Outlook annually and has done so as planned in 2022. DESC planned to use the 2022 AEO in the long-term forecast which is consistent with operative orders and directives. IRP decisions are typically not impacted by pricing in the first 12 to 24 months. In light of comments from stakeholders and consistent with previous practices at DESC, it will use the NYMEX forecast in the short-term forecast and the 2022 AEO in the long-term forecast. DESC will not be performing any late-filed runs. Its annual update filings are intended to update base planning assumptions used in previously approved IRPs.
We are requesting to see the spreadsheet(s) showing how the build costs are set up in PLEXOS in advance of the IRP being filed, given our various concerns about how the build costs were set up for the 2022 IRP Update	DESC will not be providing PLEXOS modeling in advance of the 2023 IRP filing date. The methodology that will be used is consistent with the modeling methodology used in previous IRPs and updates.

3. Update Stakeholder Advisory meeting schedule?

Stakeholder Comments	Response / Action Taken
Three Stakeholder Advisory meetings should be sufficient. If more are required, I would recommend the Company continue to be flexible to adjust the amount as needed.	DESC agrees and will remain flexible to adjust the number of sessions needed.

3. Update Stakeholder Advisory meeting schedule?

Stakeholder Comments	Response / Action Taken
We respectfully request that DESC's stakeholder engagement plan be amended to include quarterly (4 per year) Stakeholder Advisory meetings—instead of three—and that DESC provide any data, preliminary results, and supplementary material (i.e. the TIA, Planning Reserve Margin and ELCC Study, etc.) as soon as they become available to ensure a robust discussion at the quarterly meetings.	DESC remains flexible as to the number of sessions needed. As topics evolve that require an adhoc meeting(s) (e.g. results of a TIA or study), DESC would provide the results in advance and schedule a session(s) for discussion. Sesson VIII-A is an example where an adhoc session was scheduled.

3. Update Stakeholder Advisory meeting schedule?

Stakeholder Comments	Response / Action Taken
We are more interested in the substance and productivity of future meetings than the absolute number of meetings. We prefer to avoid perfunctory meetings in lieu of meetings focused on priority topics where DESC requests timely feedback that can be incorporated into the Company's planning efforts. For example, when DESC made the decision in late summer to switch to Astrapé for its LOLE study, that would have been an ideal time to schedule a meeting and receive feedback prior to commencing that analysis.	DESC agrees that the number of meetings are not as important as the substance of the sessions. The IRP Stakeholder Advisory Group has held ten sessions where priority topics were discussed, advanced, and considered in DESC's integrated resource planning. As additional priority topics are raised either during a session or in the homework, DESC will schedule sessions for timely discussion.

Questions? Please use the Chat function

DESC IRP Stakeholder Advisory Group Meeting #10

II. Study Results

Study Results

- 2023 DSM Potential Study
- 2023 EV Study
- 2023 Reserve Margin/ELCC Study
- *Discussion*

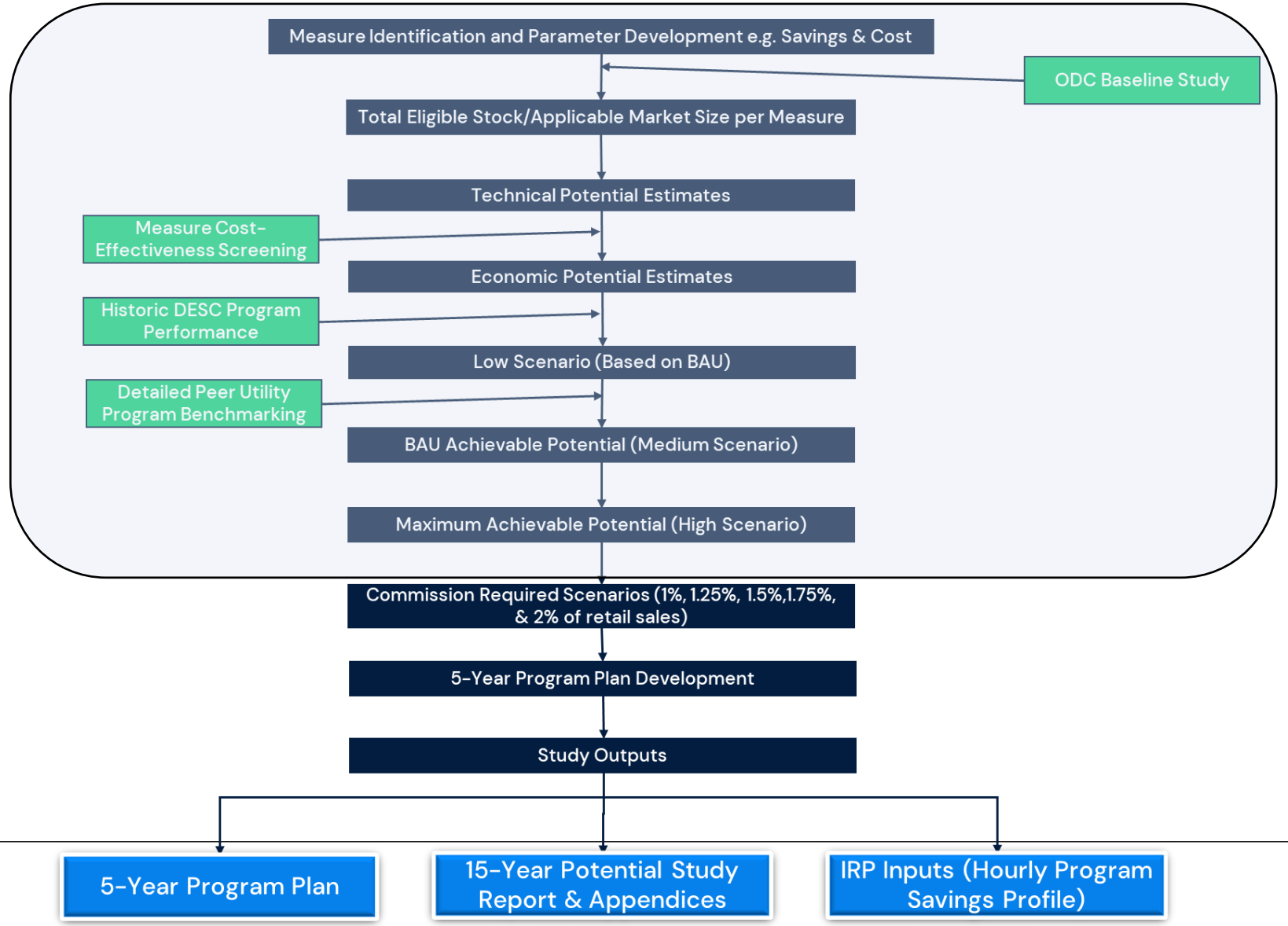
Potential Study Updates

Dominion Energy South Carolina

Drew Durkee
Senior Manager, Flexible Load Management

Image source: DESC, https://www.dominionenergy.com/our-stories/dear-valued-customer-in-sc

Project Flow and Status



Energy Efficiency Potential

Residential BAU Results – Gross

Program (Gross MWh)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Appliance Recycling	4,212	4,106	3,999	3,900	3,804	3,714	3,827	3,947	4,043	4,132	4,218	4,292	4,369	4,454	4,502
Heating, Cooling, and Water Heating	7,900	8,079	8,249	8,425	8,600	8,777	8,940	9,150	9,327	9,513	9,712	9,905	10,099	10,306	10,422
Home Energy Checkup - Tier 1	1,892	1,795	1,693	1,589	1,481	1,370	1,393	1,423	1,448	1,475	1,297	1,321	1,344	1,370	1,384
Home Energy Checkup - Tier 2	583	560	538	517	497	479	481	465	449	434	422	409	397	371	361
Home Energy Report	17,777	18,159	18,521	18,895	19,268	19,647	19,994	20,443	20,821	21,217	21,642	22,055	22,469	22,915	23,162
Multifamily	1,341	1,135	936	741	546	349	352	358	362	367	363	368	372	378	380
Neighborhood Energy Efficiency	4,611	3,935	3,253	2,563	1,855	1,874	1,890	1,916	1,934	1,955	1,621	1,636	1,651	1,669	1,671
Online Marketplace	2,168	1,707	1,730	1,753	1,776	1,800	1,820	1,849	1,872	1,896	1,913	1,938	1,963	1,990	2,000
Residential Portfolio	**40,484**	**39,477**	**38,918**	**38,382**	**37,828**	**38,009**	**38,696**	**39,552**	**40,257**	**40,988**	**41,189**	**41,923**	**42,665**	**43,452**	**43,882**

Program (Gross MW)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Appliance Recycling	0.72	0.70	0.68	0.67	0.65	0.64	0.65	0.67	0.69	0.71	0.72	0.73	0.75	0.76	0.77
Heating, Cooling, and Water Heating	3.74	3.83	3.91	3.99	4.08	4.16	4.24	4.34	4.42	4.51	4.60	4.70	4.79	4.89	4.94
Home Energy Checkup - Tier 1	0.19	0.19	0.18	0.17	0.17	0.16	0.16	0.17	0.17	0.17	0.15	0.15	0.16	0.16	0.16
Home Energy Checkup - Tier 2	0.35	0.34	0.32	0.31	0.30	0.29	0.29	0.28	0.27	0.26	0.25	0.25	0.24	0.22	0.22
Home Energy Report	3.04	3.10	3.16	3.23	3.29	3.36	3.42	3.49	3.56	3.62	3.70	3.77	3.84	3.91	3.96
Multifamily	0.20	0.17	0.14	0.11	0.09	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Neighborhood Energy Efficiency	0.83	0.75	0.68	0.60	0.52	0.53	0.53	0.53	0.54	0.54	0.51	0.51	0.51	0.52	0.52
Online Marketplace	1.20	0.90	0.91	0.92	0.93	0.94	0.95	0.97	0.98	0.99	1.00	1.02	1.03	1.04	1.05
Residential Portfolio	**10.27**	**9.98**	**9.99**	**10.01**	**10.03**	**10.13**	**10.30**	**10.51**	**10.68**	**10.86**	**10.99**	**11.18**	**11.37**	**11.56**	**11.67**

Residential BAU Results – Net

Program (Net MWh)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Appliance Recycling	2,629	2,565	2,501	2,441	2,383	2,329	2,399	2,474	2,534	2,589	2,643	2,689	2,738	2,791	2,821
Heating, Cooling, and Water Heating	5,202	5,320	5,431	5,547	5,662	5,779	5,886	6,024	6,141	6,263	6,394	6,521	6,649	6,784	6,861
Home Energy Checkup - Tier 1	1,892	1,795	1,693	1,589	1,481	1,370	1,393	1,423	1,448	1,475	1,297	1,321	1,344	1,370	1,384
Home Energy Checkup - Tier 2	583	560	538	517	497	479	481	465	449	434	422	409	397	371	361
Home Energy Report	17,777	18,159	18,521	18,895	19,268	19,647	19,994	20,443	20,821	21,217	21,642	22,055	22,469	22,915	23,162
Multifamily	1,341	1,135	936	741	546	349	352	358	362	367	363	368	372	378	380
Neighborhood Energy Efficiency	4,611	3,935	3,253	2,563	1,855	1,874	1,890	1,916	1,934	1,955	1,621	1,636	1,651	1,669	1,671
Online Marketplace	1,526	1,391	1,409	1,429	1,448	1,467	1,484	1,508	1,527	1,547	1,560	1,581	1,601	1,624	1,633
Residential Portfolio	**35,561**	**34,860**	**34,282**	**33,721**	**33,141**	**33,293**	**33,879**	**34,612**	**35,216**	**35,846**	**35,943**	**36,579**	**37,222**	**37,901**	**38,272**

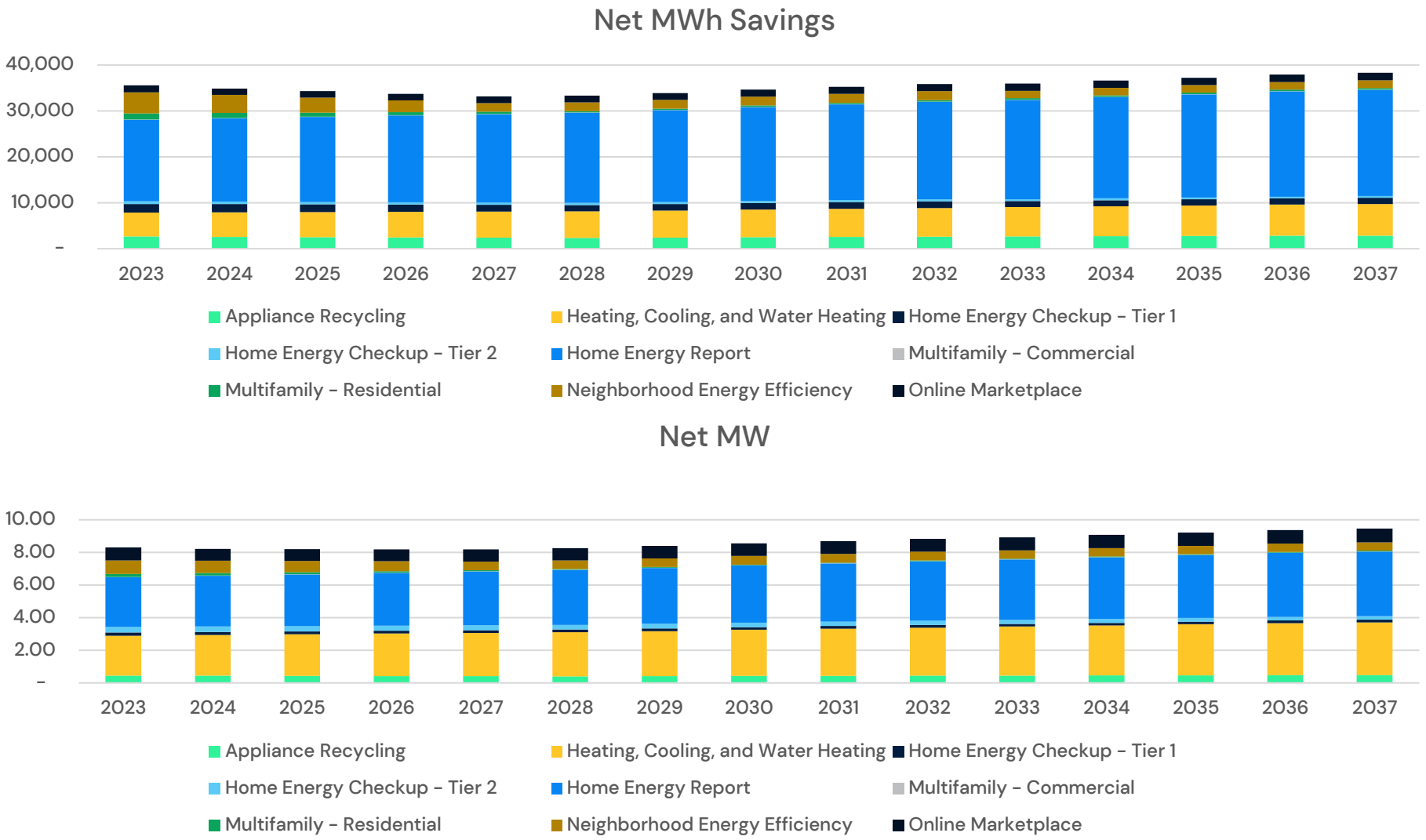
Program (Net MW)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Appliance Recycling	0.45	0.44	0.43	0.42	0.41	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.48
Heating, Cooling, and Water Heating	2.44	2.50	2.55	2.60	2.66	2.71	2.76	2.83	2.88	2.94	3.00	3.06	3.12	3.19	3.22
Home Energy Checkup - Tier 1	0.19	0.19	0.18	0.17	0.17	0.16	0.16	0.17	0.17	0.17	0.15	0.15	0.16	0.16	0.16
Home Energy Checkup - Tier 2	0.35	0.34	0.32	0.31	0.30	0.29	0.29	0.28	0.27	0.26	0.25	0.25	0.24	0.22	0.22
Home Energy Report	3.04	3.10	3.16	3.23	3.29	3.36	3.42	3.49	3.56	3.62	3.70	3.77	3.84	3.91	3.96
Multifamily	0.20	0.17	0.14	0.11	0.09	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Neighborhood Energy Efficiency	0.83	0.75	0.68	0.60	0.52	0.53	0.53	0.53	0.54	0.54	0.51	0.51	0.51	0.52	0.52
Online Marketplace	0.81	0.72	0.73	0.73	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.83
Residential Portfolio	**8.31**	**8.20**	**8.19**	**8.18**	**8.18**	**8.25**	**8.39**	**8.55**	**8.69**	**8.83**	**8.92**	**9.07**	**9.21**	**9.37**	**9.45**

Residential BAU Results – Costs

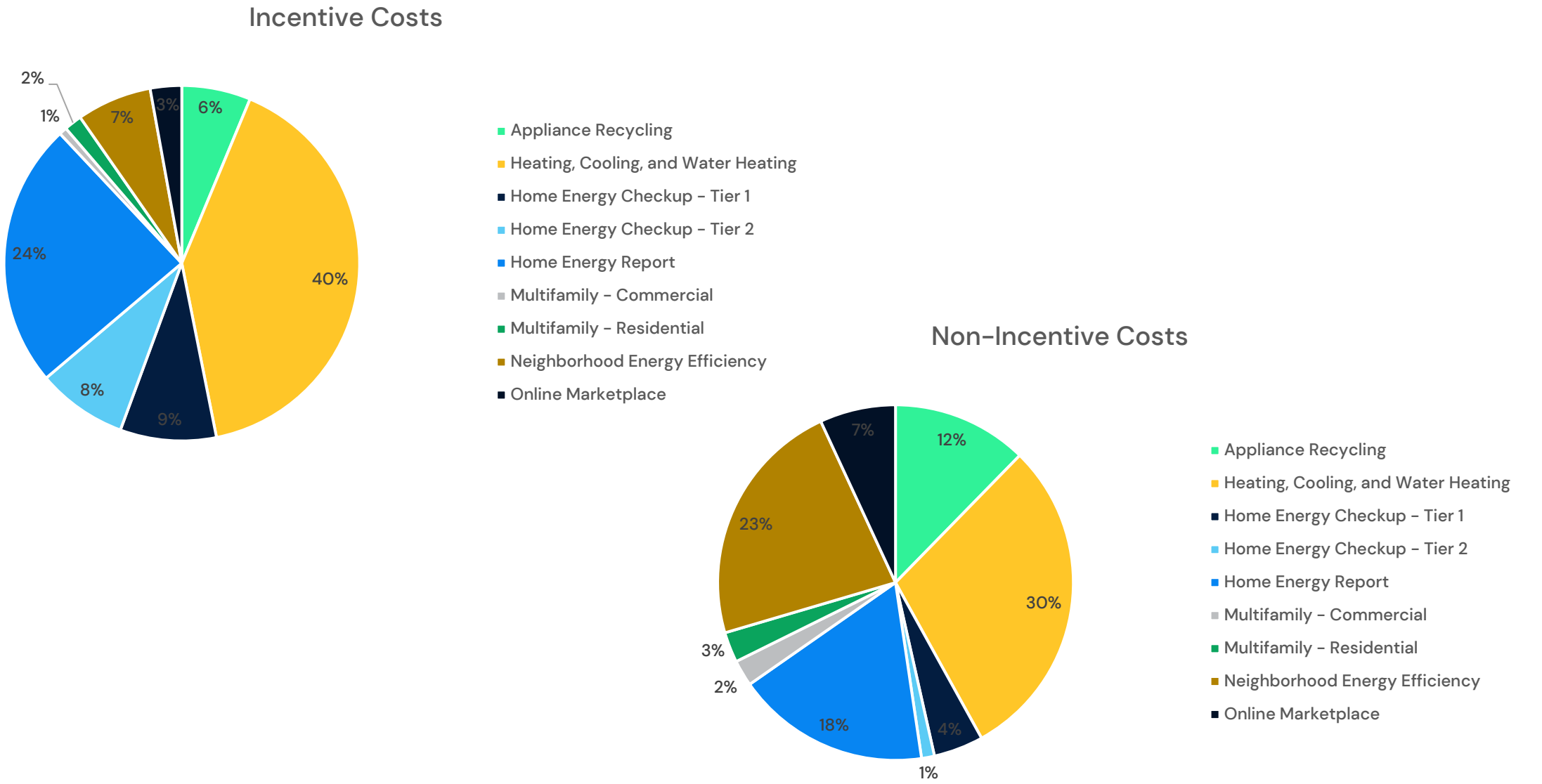
Program (Incentives - $1,000s)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Appliance Recycling	$648	$632	$616	$600	$585	$572	$589	$607	$622	$636	$649	$660	$672	$685	$693
Heating, Cooling, and Water Heating	$3,522	$3,602	$3,677	$3,755	$3,834	$3,913	$3,985	$4,079	$4,158	$4,241	$4,330	$4,416	$4,502	$4,595	$4,647
Home Energy Checkup - Tier 1	$1,121	$1,063	$1,003	$941	$878	$812	$825	$843	$858	$874	$769	$783	$797	$812	$820
Home Energy Checkup - Tier 2	$1,037	$996	$956	$919	$884	$851	$855	$827	$798	$771	$750	$727	$705	$659	$641
Home Energy Report	$2,113	$2,158	$2,201	$2,246	$2,290	$2,335	$2,377	$2,430	$2,475	$2,522	$2,573	$2,622	$2,671	$2,724	$2,753
Multifamily	$487	$420	$356	$293	$231	$167	$168	$170	$171	$172	$171	$173	$174	$176	$177
Neighborhood Energy Efficiency	$1,395	$1,191	$984	$776	$561	$567	$572	$580	$585	$591	$491	$495	$500	$505	$506
Online Marketplace	$332	$261	$265	$268	$272	$275	$278	$283	$286	$290	$293	$297	$300	$305	$306
Residential Portfolio	**$10,654**	**$10,324**	**$10,058**	**$9,799**	**$9,535**	**$9,492**	**$9,650**	**$9,819**	**$9,954**	**$10,097**	**$10,024**	**$10,171**	**$10,322**	**$10,460**	**$10,542**

Program (Non-Incentives - $1,000s)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Appliance Recycling	$502	$490	$477	$465	$454	$443	$456	$471	$482	$493	$503	$512	$521	$531	$537
Heating, Cooling, and Water Heating	$1,016	$1,039	$1,061	$1,084	$1,106	$1,129	$1,150	$1,177	$1,200	$1,224	$1,249	$1,274	$1,299	$1,326	$1,341
Home Energy Checkup - Tier 1	$165	$169	$172	$175	$179	$182	$185	$189	$192	$196	$172	$175	$179	$182	$184
Home Energy Checkup - Tier 2	$59	$56	$54	$52	$50	$48	$48	$47	$45	$44	$42	$41	$40	$37	$36
Home Energy Report	$609	$622	$635	$647	$660	$673	$685	$700	$713	$727	$742	$756	$770	$785	$794
Multifamily	$376	$331	$287	$245	$202	$159	$160	$161	$162	$163	$162	$163	$164	$165	$165
Neighborhood Energy Efficiency	$894	$904	$912	$922	$931	$941	$949	$961	$971	$981	$814	$821	$829	$837	$839
Online Marketplace	$317	$249	$253	$256	$260	$263	$266	$270	$274	$277	$280	$283	$287	$291	$292
Residential Portfolio	**$3,938**	**$3,860**	**$3,851**	**$3,846**	**$3,842**	**$3,838**	**$3,899**	**$3,977**	**$4,039**	**$4,104**	**$3,964**	**$4,026**	**$4,088**	**$4,155**	**$4,188**

Residential Program Level Summary – Savings



Residential Program Level Summary – Costs



Residential BAU – Summary and Cost-Effectiveness

Residential	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
MWh Savings (Gross)	40,484	39,477	38,918	38,382	37,828	38,009	38,696	39,552	40,257	40,988	41,189	41,923	42,665	43,452	43,882
MWh Savings (Net)	35,561	34,860	34,282	33,721	33,141	33,293	33,879	34,612	35,216	35,846	35,943	36,579	37,222	37,901	38,272
Gross Savings % of 2021 Sales	0.19%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.19%	0.19%	0.19%	0.19%	0.20%	0.20%	0.20%
Net Savings % of 2021 Sales	0.17%	0.16%	0.16%	0.16%	0.15%	0.15%	0.16%	0.16%	0.16%	0.17%	0.17%	0.17%	0.17%	0.18%	0.18%
Gross Savings % of 2021 Sales (Excl Opt-Out)	0.24%	0.23%	0.23%	0.23%	0.22%	0.23%	0.23%	0.24%	0.24%	0.24%	0.24%	0.25%	0.25%	0.26%	0.26%
Net Savings % of 2021 Sales (Excl Opt-Out)	0.21%	0.21%	0.20%	0.20%	0.20%	0.20%	0.20%	0.21%	0.21%	0.21%	0.21%	0.22%	0.22%	0.23%	0.23%
Winter MW Savings (Gross)	10.27	9.98	9.99	10.01	10.03	10.13	10.30	10.51	10.68	10.86	10.99	11.18	11.37	11.56	11.67
Winter MW Savings (Net)	8.31	8.20	8.19	8.18	8.18	8.25	8.39	8.55	8.69	8.83	8.92	9.07	9.21	9.37	9.45
Incentive Costs ($1,000s)	$10,654	$10,324	$10,058	$9,799	$9,535	$9,492	$9,650	$9,819	$9,954	$10,097	$10,024	$10,171	$10,322	$10,460	$10,542
Non-Incentive Costs ($1,000s)	$3,938	$3,860	$3,851	$3,846	$3,842	$3,838	$3,899	$3,977	$4,039	$4,104	$3,964	$4,026	$4,088	$4,155	$4,188
Total Costs ($1,000s)	$14,593	$14,184	$13,910	$13,646	$13,377	$13,330	$13,549	$13,796	$13,993	$14,201	$13,988	$14,197	$14,410	$14,615	$14,730

Program Name	TRC	UCT	RIM	PCT	SCT	Annual $/kWh	Annual $/kW	kWh Levelized Cost	kW Levelized Cost
Appliance Recycling	1.0	1.0	0.4	5.4	1.1	$ 0.44	$ 2,551	$ 0.08	$ 477
Heating, Cooling, and Water Heating	1.2	1.8	0.6	1.9	1.5	$ 0.87	$ 1,858	$ 0.07	$ 152
Home Energy Checkup - Tier 1	1.7	0.9	0.4	5.8	30.6	$ 0.71	$ 6,327	$ 0.09	$ 808
Home Energy Checkup - Tier 2	0.5	1.0	0.5	0.9	0.7	$ 1.88	$ 3,125	$ 0.15	$ 244
Home Energy Report	1.2	0.5	0.3	7.4	1.2	$ 0.15	$ 896	$ 0.15	$ 896
Multifamily - Commercial	0.5	0.4	0.3	3.0	0.6	$ 3.33	$ 9,112	$ 0.29	$ 761
Multifamily - Residential	2.4	1.4	0.4	11.7	141.3	$ 0.54	$ 3,989	$ 0.06	$ 411
Neighborhood Energy Efficiency	1.1	1.2	0.4	3.3	33.4	$ 0.70	$ 2,764	$ 0.08	$ 327
Online Marketplace	2.5	2.9	0.7	4.6	14.3	$ 0.37	$ 722	$ 0.04	$ 83
Residential Portfolio	**1.2**	**1.3**	**0.5**	**2.6**	**8.5**	**$ 0.40**	**$ 1,622**	**$ 0.09**	**$ 244**

Non-Residential BAU Results – Gross and Net

Program Name (Gross MWh)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
EnergyWise for Your Business	34,288	34,568	36,076	35,132	34,194	33,262	32,342	31,425	30,564	29,658	28,766	27,875	27,101	26,229	25,365
Municipal Lighting	1,375	1,321	1,269	-	-	-	-	-	-	-	-	-	-	-	-
Small Business Energy Solutions	8,944	8,665	8,386	8,108	7,831	7,555	7,280	7,006	6,733	6,461	6,191	5,922	5,655	5,390	5,127
TOTAL	**44,607**	**44,554**	**45,731**	**43,240**	**42,025**	**40,816**	**39,621**	**38,430**	**37,297**	**36,119**	**34,958**	**33,798**	**32,757**	**31,619**	**30,492**

Program Name (Gross MW)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
EnergyWise for Your Business	4.19	4.22	4.38	4.27	4.16	4.06	3.95	3.85	3.75	3.64	3.54	3.44	3.35	3.25	3.16
Municipal Lighting	0.15	0.15	0.14	-	-	-	-	-	-	-	-	-	-	-	-
Small Business Energy Solutions	1.33	1.30	1.26	1.23	1.20	1.17	1.14	1.11	1.07	1.04	1.01	0.98	0.95	0.92	0.89
Total	**5.67**	**5.66**	**5.78**	**5.50**	**5.36**	**5.23**	**5.09**	**4.96**	**4.82**	**4.69**	**4.55**	**4.42**	**4.30**	**4.18**	**4.05**

Program Name (Net MWh)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
EnergyWise for Your Business	21,718	22,353	24,210	23,619	23,030	22,446	21,869	21,294	20,755	20,187	19,629	19,071	18,586	18,040	17,500
Municipal Lighting	1,375	1,321	1,269	-	-	-	-	-	-	-	-	-	-	-	-
Small Business Energy Solutions	7,635	7,399	7,164	6,930	6,697	6,465	6,233	6,002	5,772	5,544	5,316	5,090	4,865	4,642	4,420
TOTAL	**30,728**	**31,073**	**32,644**	**30,549**	**29,727**	**28,910**	**28,102**	**27,297**	**26,527**	**25,731**	**24,945**	**24,161**	**23,451**	**22,682**	**21,919**

Program Name (Net MW)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
EnergyWise for Your Business	2.65	2.72	2.91	2.85	2.78	2.71	2.65	2.58	2.52	2.46	2.39	2.33	2.27	2.21	2.15
Municipal Lighting	0.15	0.15	0.14	-	-	-	-	-	-	-	-	-	-	-	-
Small Business Energy Solutions	1.17	1.14	1.11	1.09	1.06	1.03	1.00	0.98	0.95	0.93	0.90	0.87	0.85	0.82	0.80
Total	**3.97**	**4.00**	**4.17**	**3.93**	**3.84**	**3.75**	**3.65**	**3.56**	**3.47**	**3.38**	**3.29**	**3.20**	**3.12**	**3.03**	**2.95**

Non-Residential BAU Results – Costs

Program Name (Incentive Costs - $1,000s)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
EnergyWise for Your Business	$3,835	$3,778	$3,772	$3,667	$3,563	$3,459	$3,357	$3,255	$3,159	$3,058	$2,959	$2,860	$2,774	$2,676	$2,580
Municipal Lighting	$675	$649	$623	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Small Business Energy Solutions	$2,549	$2,470	$2,390	$2,311	$2,232	$2,153	$2,075	$1,997	$1,919	$1,842	$1,765	$1,688	$1,612	$1,536	$1,461
Total	**$7,060**	**$6,896**	**$6,786**	**$5,978**	**$5,795**	**$5,612**	**$5,432**	**$5,252**	**$5,078**	**$4,900**	**$4,724**	**$4,548**	**$4,386**	**$4,213**	**$4,041**

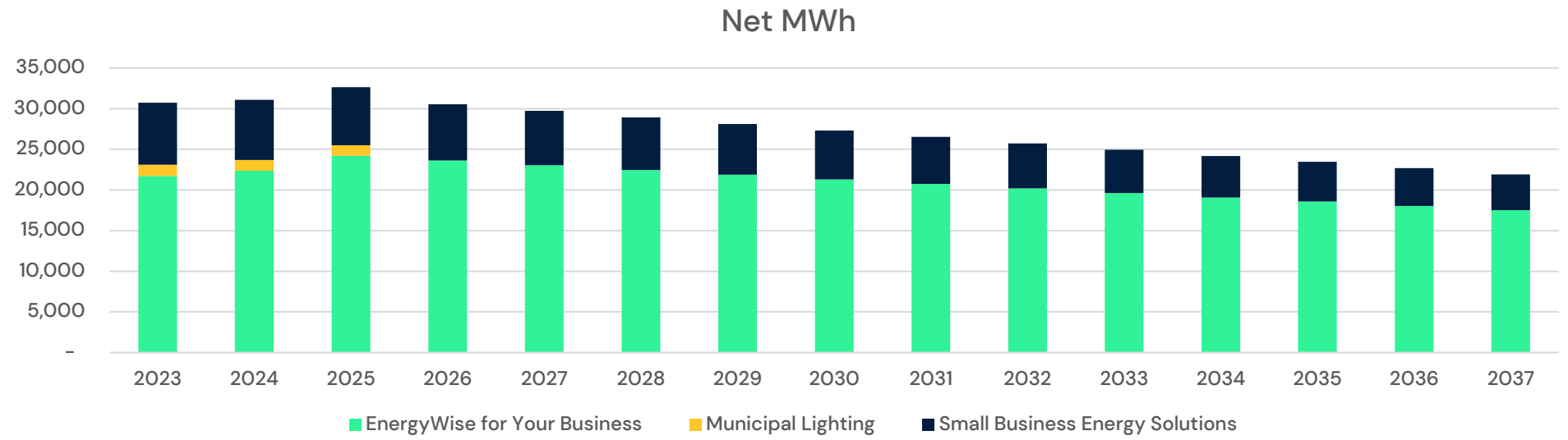
Program Name (Non-Incentive Costs - $1,000s)	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
EnergyWise for Your Business	$2,573	$2,551	$2,579	$2,509	$2,440	$2,371	$2,304	$2,236	$2,172	$2,105	$2,040	$1,974	$1,917	$1,852	$1,788
Municipal Lighting	$43	$42	$40	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Small Business Energy Solutions	$968	$938	$908	$878	$848	$818	$788	$758	$729	$699	$670	$641	$612	$583	$555
Total	**$3,584**	**$3,530**	**$3,527**	**$3,387**	**$3,288**	**$3,189**	**$3,092**	**$2,994**	**$2,901**	**$2,805**	**$2,710**	**$2,615**	**$2,529**	**$2,436**	**$2,343**

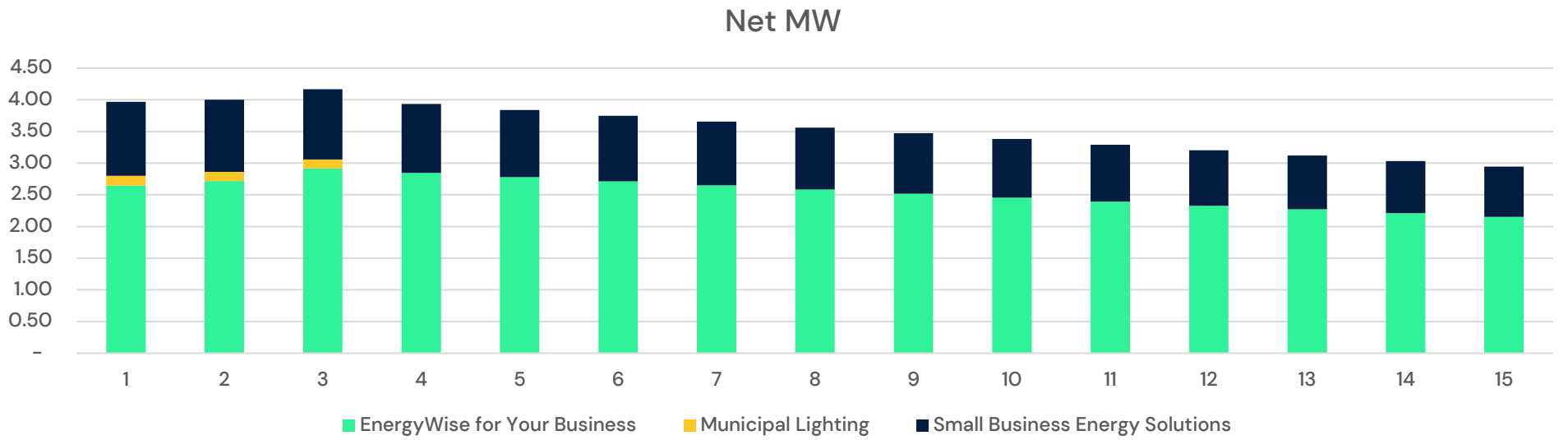
Non-Residential BAU – Summary and Cost-Effectiveness

Non-Residential	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
MWh Savings (Gross)	44,607	44,554	45,731	43,240	42,025	40,816	39,621	38,430	37,297	36,119	34,958	33,798	32,757	31,619	30,492
MWh Savings (Net)	30,728	31,073	32,644	30,549	29,727	28,910	28,102	27,297	26,527	25,731	24,945	24,161	23,451	22,682	21,919
Gross Savings % of 2021 Sales	0.21%	0.21%	0.21%	0.20%	0.20%	0.19%	0.18%	0.18%	0.17%	0.17%	0.16%	0.16%	0.15%	0.15%	0.14%
Net Savings % of 2021 Sales	0.14%	0.14%	0.15%	0.14%	0.14%	0.13%	0.13%	0.13%	0.12%	0.12%	0.12%	0.11%	0.11%	0.11%	0.10%
Gross Savings % of 2021 Sales (Excl Opt-Out)	0.27%	0.26%	0.27%	0.26%	0.25%	0.24%	0.24%	0.23%	0.22%	0.21%	0.21%	0.20%	0.19%	0.19%	0.18%
Net Savings % of 2021 Sales (Excl Opt-Out)	0.18%	0.18%	0.19%	0.18%	0.18%	0.17%	0.17%	0.16%	0.16%	0.15%	0.15%	0.14%	0.14%	0.13%	0.13%
Winter MW Savings (Gross)	5.67	5.66	5.78	5.50	5.36	5.23	5.09	4.96	4.82	4.69	4.55	4.42	4.30	4.18	4.05
Winter MW Savings (Net)	3.97	4.00	4.17	3.93	3.84	3.75	3.65	3.56	3.47	3.38	3.29	3.20	3.12	3.03	2.95
Incentive Costs ($1,000s)	$7,060	$6,896	$6,786	$5,978	$5,795	$5,612	$5,432	$5,252	$5,078	$4,900	$4,724	$4,548	$4,386	$4,213	$4,041
Non-Incentive Costs ($1,000s)	$3,584	$3,530	$3,527	$3,387	$3,288	$3,189	$3,092	$2,994	$2,901	$2,805	$2,710	$2,615	$2,529	$2,436	$2,343
Total Costs ($1,000s)	$10,644	$10,426	$10,313	$9,365	$9,083	$8,802	$8,523	$8,246	$7,979	$7,705	$7,433	$7,162	$6,915	$6,648	$6,385

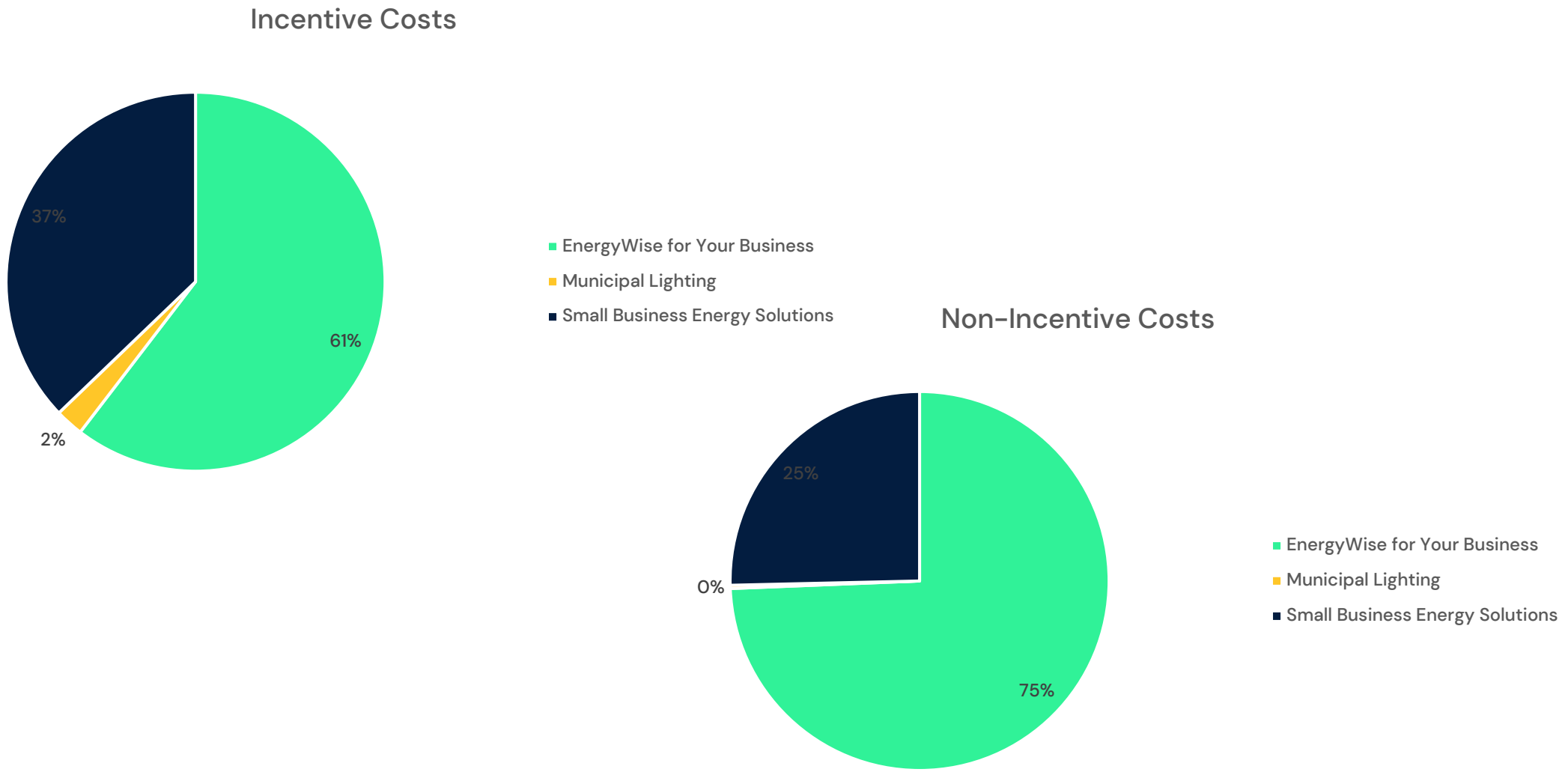
Program Name	TRC	UCT	RIM	PCT	SCT	Annual $/kWh	Annual $/kW	kWh Levelized Cost	kW Levelized Cost
EnergyWise for Your Business	1.3	2.6	0.7	2.4	1.6	$ 0.26	$ 2,152	$ 0.03	$ 251
Municipal Lighting	1.4	1.4	0.6	2.4	1.6	$ 0.52	$ 4,670	$ 0.05	$ 781
Small Business Energy Solutions	1.5	1.4	0.5	3.9	1.7	$ 0.46	$ 2,818	$ 0.06	$ 323
TOTAL	**1.4**	**2.2**	**0.7**	**2.6**	**1.6**	**$ 0.31**	**$ 2,356**	**$ 0.04**	**$ 275**

Non-Residential Program Level Summary – Savings





Non-Residential Program Level Summary - Costs

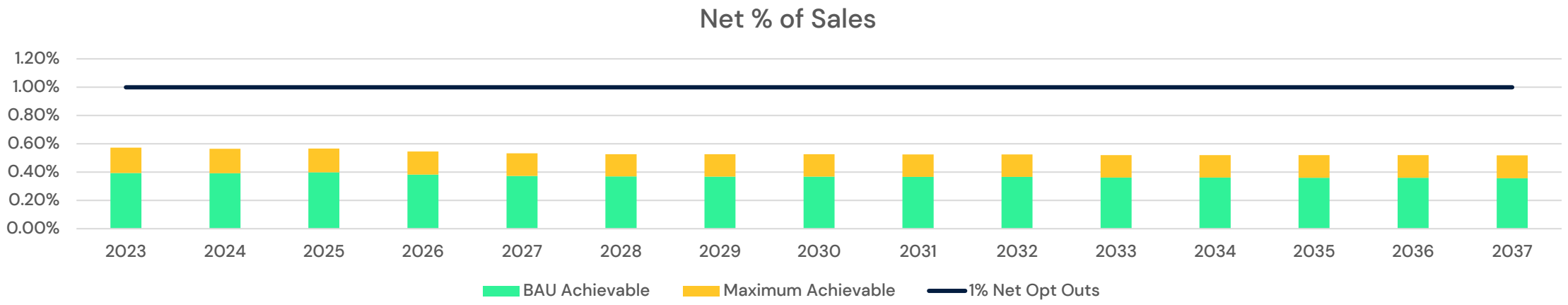


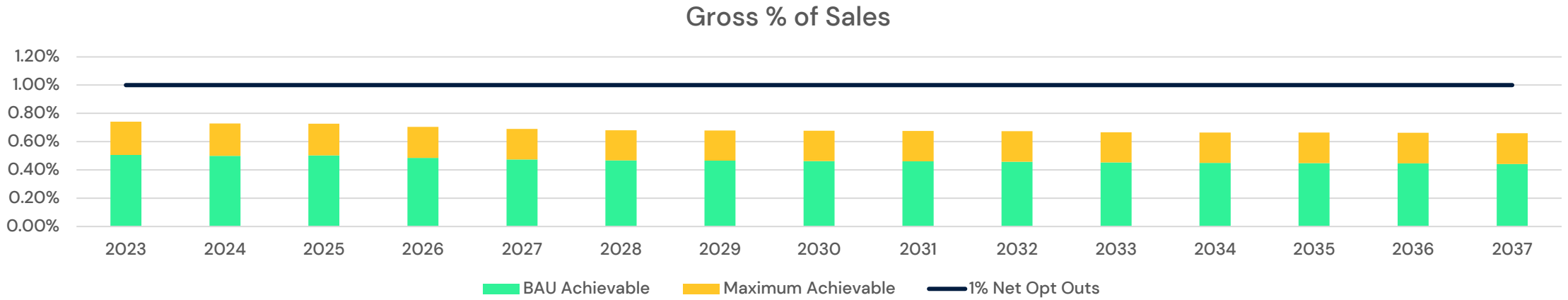
BAU Achievable vs Maximum Achievable

Business as Usual	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Residential MWh - Gross	40,484	39,477	38,918	38,382	37,828	38,009	38,696	39,552	40,257	40,988	41,189	41,923	42,665	43,452	43,882
Non-Residential MWh - Gross	44,607	44,554	45,731	43,240	42,025	40,816	39,621	38,430	37,297	36,119	34,958	33,798	32,757	31,619	30,492
Total MWh - Gross	85,092	84,030	84,649	81,622	79,853	78,825	78,318	77,982	77,554	77,107	76,146	75,721	75,422	75,071	74,373
% of Sales Including Opt Outs - Gros	0.40%	0.39%	0.39%	0.38%	0.37%	0.37%	0.36%	0.36%	0.36%	0.36%	0.35%	0.35%	0.35%	0.35%	0.35%
% of Sales Net Opt Outs - Gross	0.51%	0.50%	0.50%	0.49%	0.47%	0.47%	0.47%	0.46%	0.46%	0.46%	0.45%	0.45%	0.45%	0.45%	0.44%
Residential MWh - Net	35,561	34,860	34,282	33,721	33,141	33,293	33,879	34,612	35,216	35,846	35,943	36,579	37,222	37,901	38,272
Non-Residential MWh - Net	30,728	31,073	32,644	30,549	29,727	28,910	28,102	27,297	26,527	25,731	24,945	24,161	23,451	22,682	21,919
Total MWh - Net	66,289	65,934	66,926	64,270	62,869	62,203	61,981	61,908	61,743	61,577	60,888	60,740	60,673	60,583	60,191
% of Sales Including Opt Outs - Net	0.31%	0.31%	0.31%	0.30%	0.29%	0.29%	0.29%	0.29%	0.29%	0.29%	0.28%	0.28%	0.28%	0.28%	0.28%
% of Sales Net Opt Outs - Net	0.39%	0.39%	0.40%	0.38%	0.37%	0.37%	0.37%	0.37%	0.37%	0.37%	0.36%	0.36%	0.36%	0.36%	0.36%

Maximum Achievable	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Residential MWh - Gross	57,964	56,107	54,972	53,873	52,748	52,749	53,725	54,924	55,907	56,920	57,102	58,106	59,123	60,202	60,789
Non-Residential MWh - Gross	66,862	66,531	67,446	64,702	63,246	61,809	60,402	59,011	57,707	56,360	55,047	53,751	52,622	51,385	50,178
Total MWh - Gross	124,826	122,638	122,418	118,574	115,994	114,558	114,126	113,935	113,614	113,279	112,149	111,858	111,745	111,587	110,967
% of Sales Including Opt Outs - Gros	0.58%	0.57%	0.57%	0.55%	0.54%	0.53%	0.53%	0.53%	0.53%	0.53%	0.52%	0.52%	0.52%	0.52%	0.52%
% of Sales Net Opt Outs - Gross	0.74%	0.73%	0.73%	0.71%	0.69%	0.68%	0.68%	0.68%	0.68%	0.67%	0.67%	0.67%	0.66%	0.66%	0.66%
Residential MWh - Net	50,138	48,799	47,665	46,558	45,423	45,408	46,217	47,220	48,043	48,896	48,917	49,770	50,634	51,545	52,040
Non-Residential MWh - Net	46,127	46,253	47,613	45,314	44,296	43,290	42,303	41,328	40,406	39,458	38,533	37,619	36,809	35,933	35,076
Total MWh - Net	96,264	95,051	95,278	91,872	89,718	88,698	88,521	88,548	88,449	88,355	87,450	87,389	87,442	87,478	87,117
% of Sales Including Opt Outs - Net	0.45%	0.44%	0.44%	0.43%	0.42%	0.41%	0.41%	0.41%	0.41%	0.41%	0.41%	0.41%	0.41%	0.41%	0.40%
% of Sales Net Opt Outs - Net	0.57%	0.57%	0.57%	0.55%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.52%	0.52%	0.52%	0.52%	0.52%

Achievement vs 1% and Cost-Effectiveness





Cost Effectiveness of the Scenarios

Cost-Effectiveness (TRC)			
Program	**BAU**	**Low**	**High**
Appliance Recycling	1.03	0.98	0.97
Heating, Cooling, and Water Heating	1.21	1.19	1.06
Home Energy Checkup - Tier 1	1.74	1.68	1.60
Home Energy Checkup - Tier 2	0.54	0.54	0.47
Home Energy Report	1.21	1.15	1.15
Multifamily	1.57	1.46	1.54
Neighborhood Energy Efficiency	1.10	1.05	1.05
Online Marketplace	2.46	2.35	2.27
Residential Portfolio	***1.19***	***1.16***	***1.07***
Energy Wise for Your Business	1.35	1.31	1.17
Municipal Lighting	1.36	1.36	1.36
Small Business Energy Solutions	1.48	1.43	1.33
C&I Portfolio	***1.37***	***1.34***	***1.20***
Portfolio Total	***1.28***	***1.24***	***1.14***

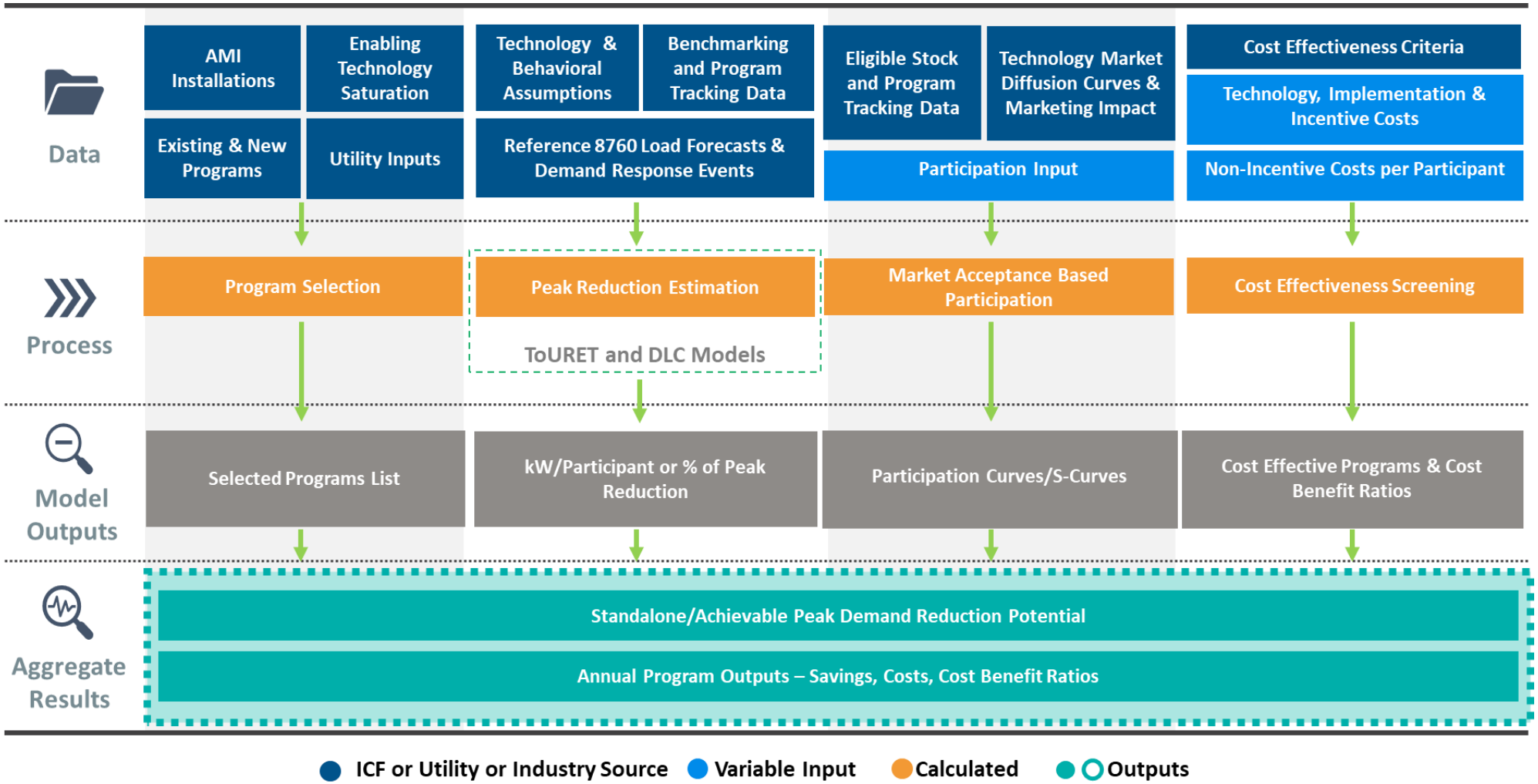
Findings and Next Steps

- Given the results of the Maximum Achievable, ICF does not find a 1% case to be achievable (and therefore higher cases to not be achievable)
- However, ICF will assess 1%, 1.25%, 1.5%, 1.75%, and 2% cases for cost-effectiveness using:
  - Assumptions in increased participation due to Investment Reduction Act (IRA) funding
  - Assumptions in increased participation due to greater market acceptance of energy efficiency
  - Introduction of non-cost-effective measures
  - Increase in savings and costs based on benchmarked developed curves
- 15-Year Potential Study IRP Inputs are Complete pending EEAG feedback
  - Low, Medium, High
- The DSM 5-Year Program Plan will require further in-depth coordination with the EEAG
  - The details of this plan will be more granular than the potential study, including:
    - Details of marketing efforts
    - Design of program delivery
    - Measure level incentive values finalization
    - Customer engagement techniques

Demand Response Potential

Approach

Achievable Potential Estimation Approach



Simplified Process Flow and Sources for Inputs

Pre-Achievable

- Cost-effectiveness screening of programs using high case TRCs

Achievable

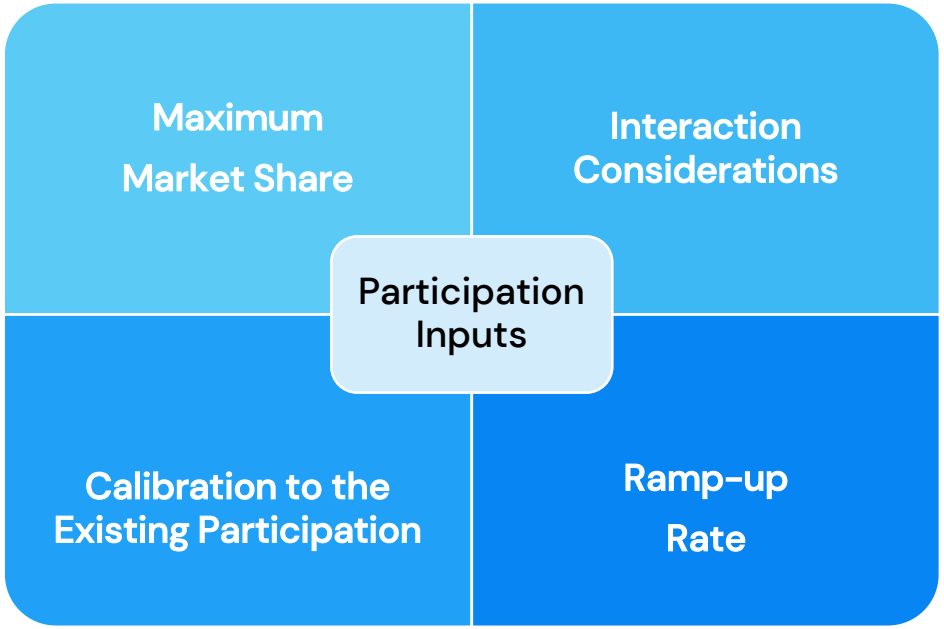
- Potential estimation for cost-effective programs

	Savings	Costs	Participation
Sources	➢ Program savings from various implementations across the country ➢ Potential studies ➢ Simulations/Modeling	➢ Calculations based on implementation/ technology estimates ➢ Potential studies	➢ ODC study ➢ Potential studies, calibrated to ODC survey data

ICF Participation Modeling Methodology

- Research and benchmarking against similar programs
- Customization to DESC based on survey

- Calibrate to current levels of program implementation

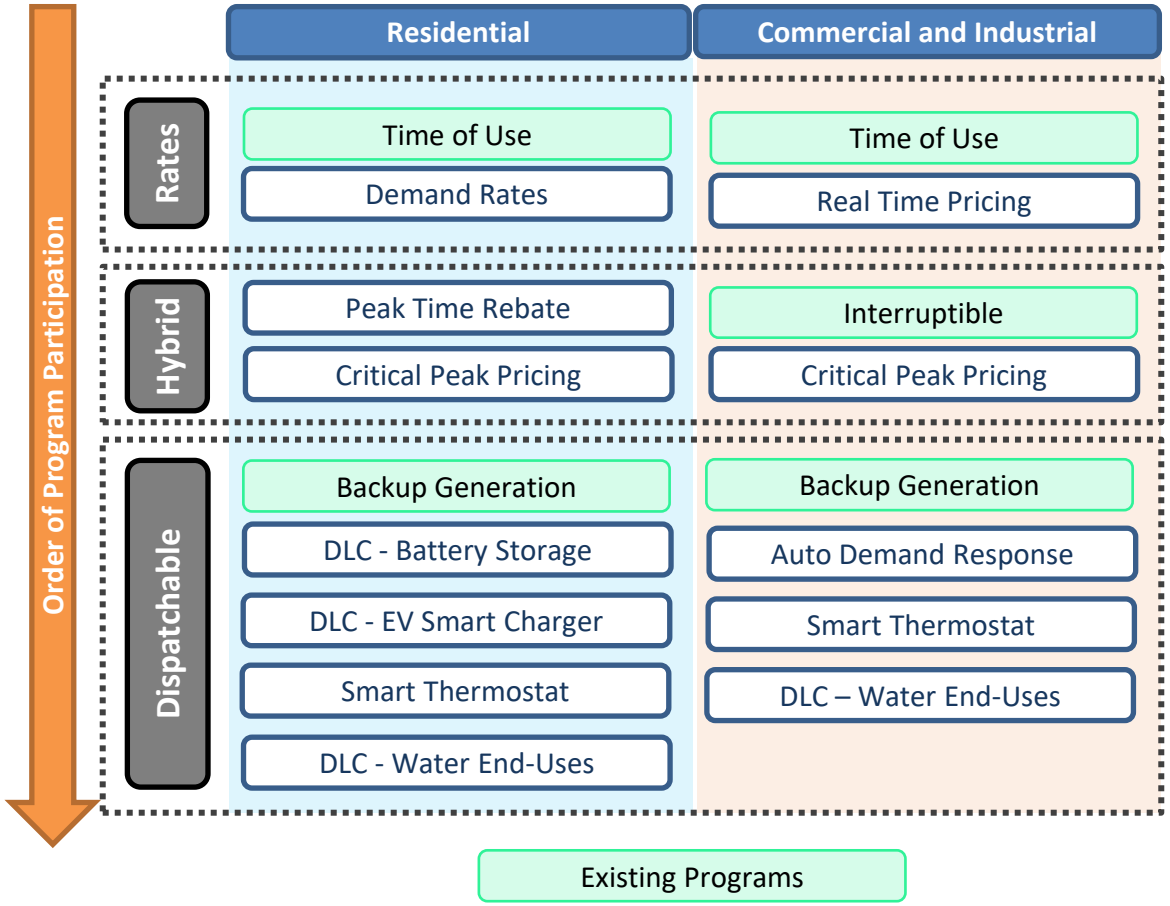


- Hierarchy of programs based on various factors
- Eligible stock accounting based on maximum market share

- Research and benchmarking against similar programs
- DESC program planning preferences
- Technology saturation and Deployment plan

Determine the Inputs → Build the bass diffusion curves → Calibrate the curves → Input the curves into DERPlanner model

Program List and Scenarios



Scenario	Definition
Achievable Reference	Reasonable and expected levels of participation (maximum market shares from ODC study, where applicable)
Achievable Low	Conservative estimates of participation
Achievable High	Aggressive marketing and implementation strategies – higher levels of participation. Usually – maximum market share set to 1.5 times the reference levels
Stand-Alone Maximum Achievable, by program	No interactive effects with other programs, achievable high scenario participation levels

Additional scenario with qualitative discussion - Stand-Alone Technical, by program - No interactive effects with other programs, participation limited only by technical feasibility.

Draft Results

Pre-Achievable Analysis – Program Screening (15-year)

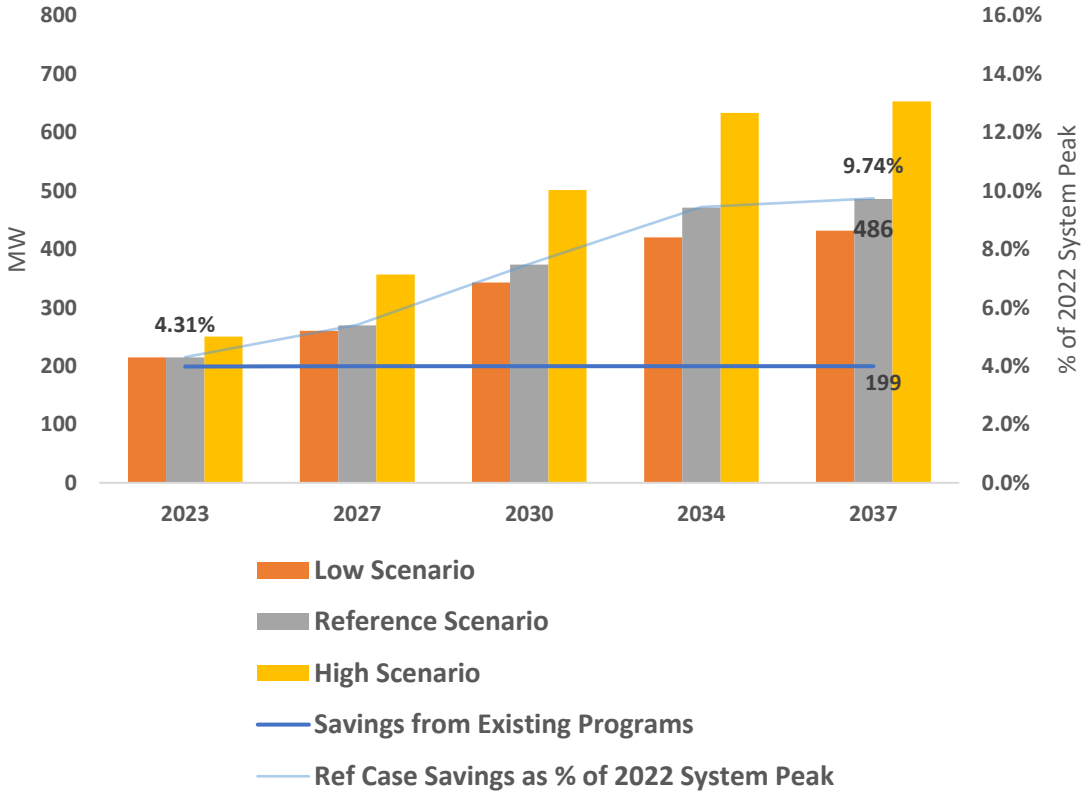
Programs that have a TRC benefit-cost ratio > 1 in the high case are included in the achievable potential

Sectors	Program	TRC High Case Benefit-Cost Ratio	
		ToU Opt In	ToU Opt Out
Res, Comm, Ind	Critical Peak Pricing	✓	✓
Res, Comm	Smart Thermostat	✓	✓
Comm, Ind	Interruptible Load	✓	✓
Comm, Ind	Real Time Pricing	✓	x
Res, Comm, Ind	Time of Use	✓	✓
Comm	Backup Generators	✓	✓
Res, Comm	Direct Load Control	x	x
Res	Demand Rate	✓	x
Comm, Ind	Auto Demand Response	x	x
Res	Battery Storage	x	x
Res	EV Smart Charger	x	x
Res	Peak Time Rebate	✓	✓

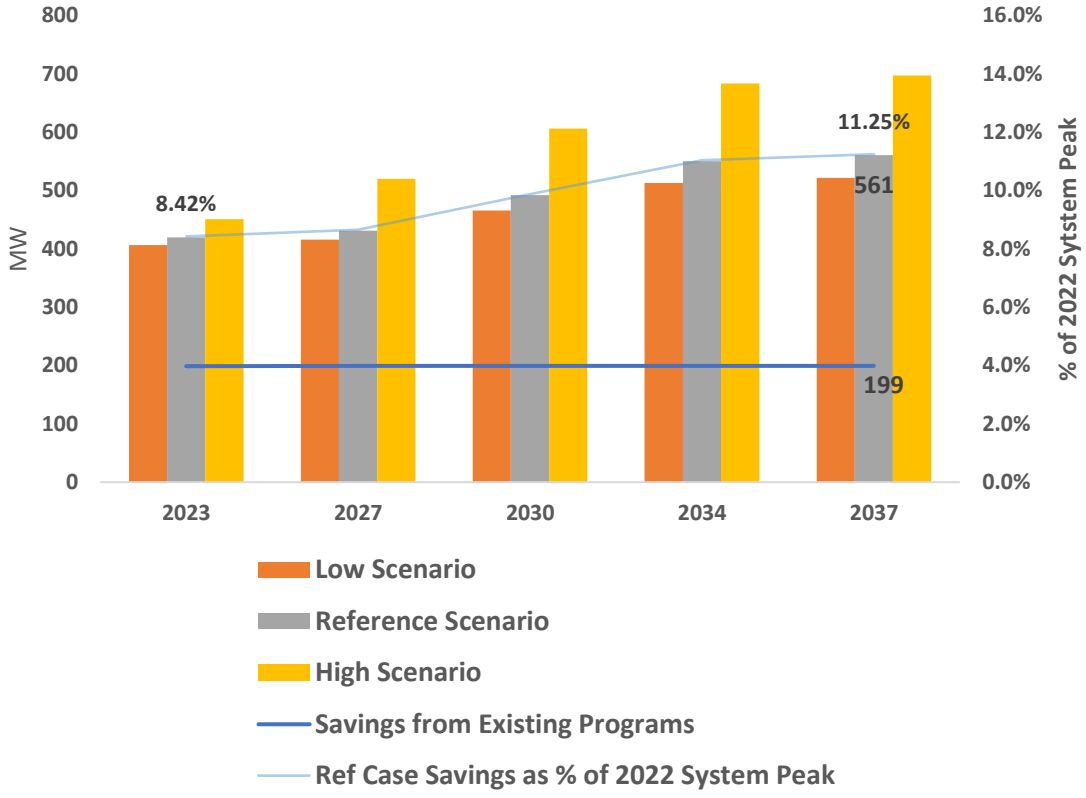
Achievable Potential – Winter Demand Savings

DR programs, in the reference case, can shave 9.47% of and 11.25% of demand from the system peak in 2037, for ToU opt-in and opt-out respectively. This translates to 486 MW and 561 MW, and these numbers include the current savings of 199 MWs from existing programs.

Case when ToU is Opt-In

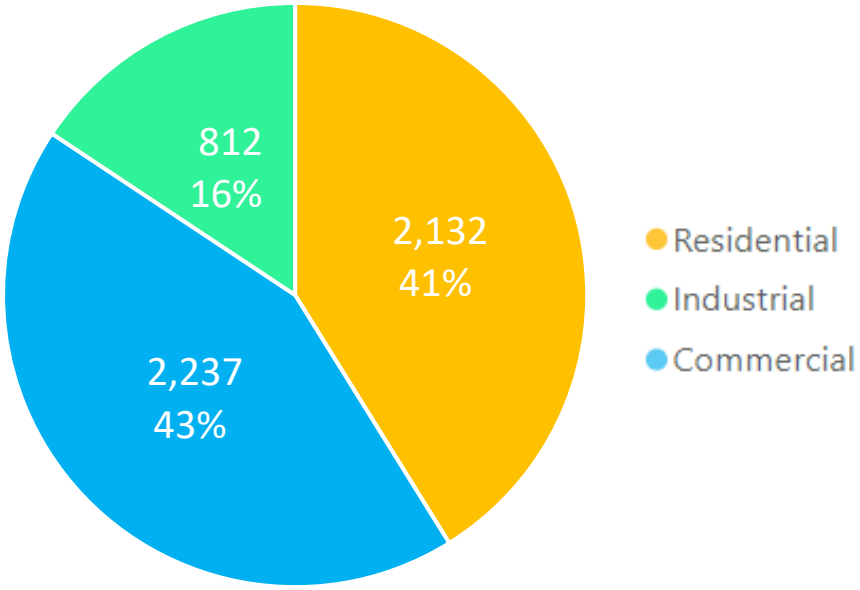


Case when ToU is Opt-Out



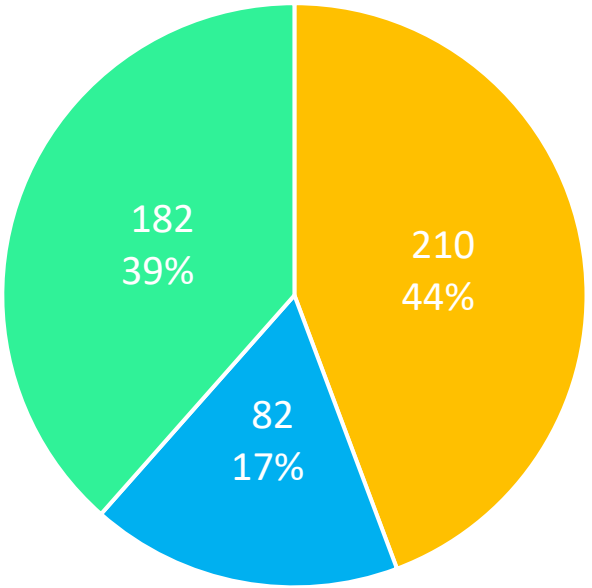
Share of Peak Contribution and Cumulative Savings, by Sector, in 2037

While residential and commercial sectors contribute most to the peak, savings contributions are from the residential and industrial sectors.

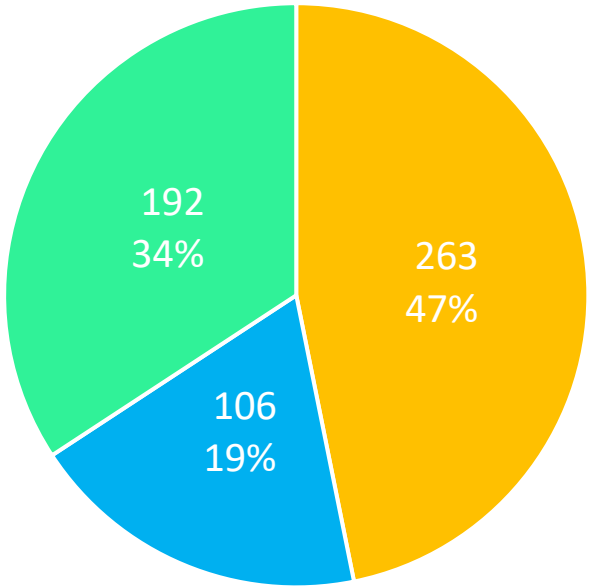


Peak Contribution (MW) by Sector, Baseline (2022)

Case when ToU is Opt-in



Case when ToU in Opt-out

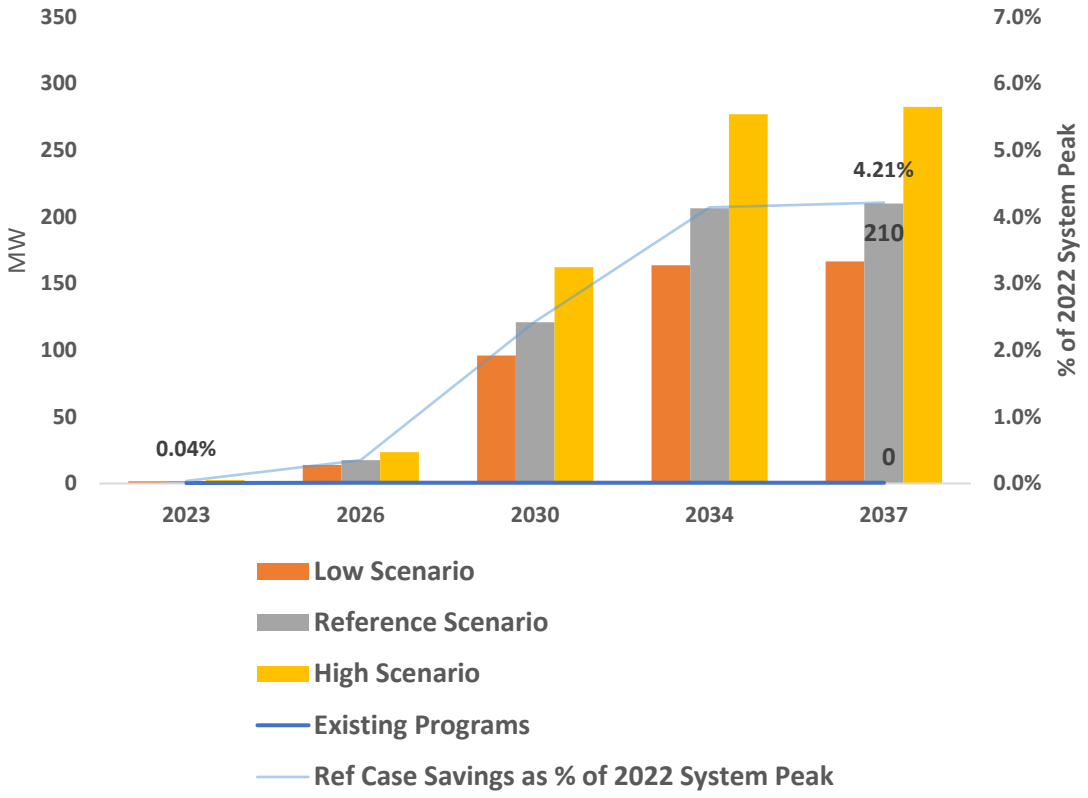


Reference Case Savings Contribution (MW), by Sector, for 2037

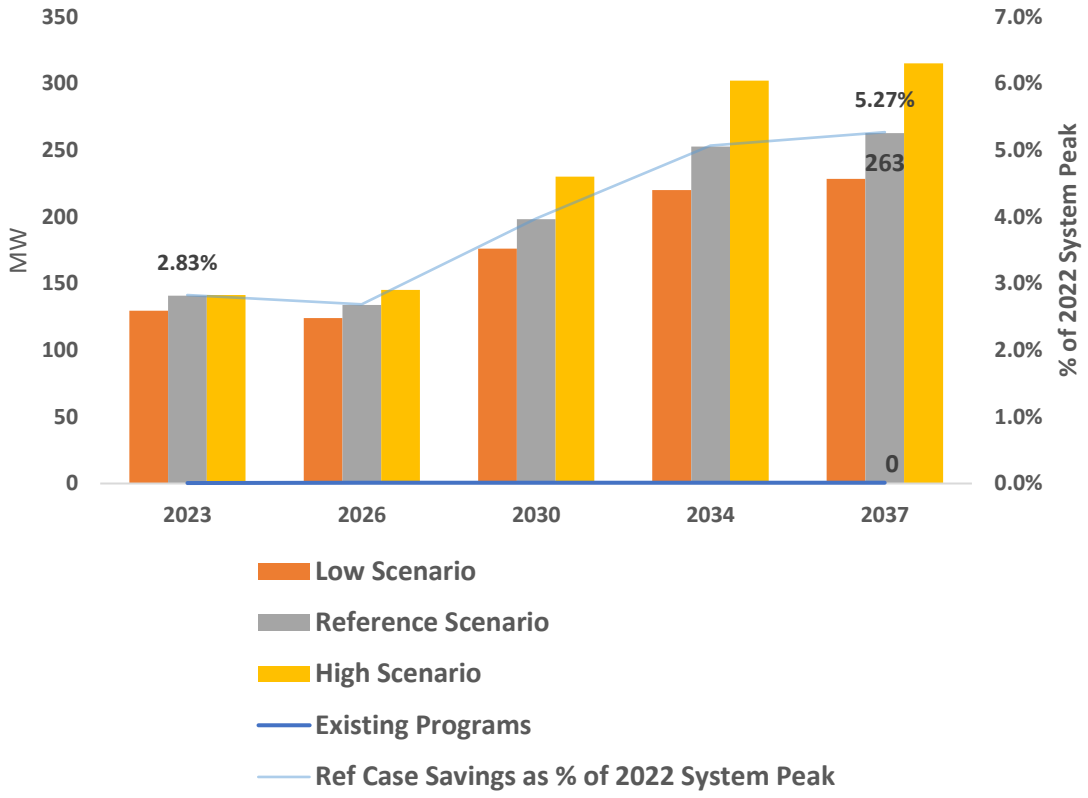
Achievable Potential Residential– Winter Demand Savings

The residential savings contribute to savings that amount to 4.21% and 5.27% of system peak by 2037, for ToU opt-in and opt-out, respectively. This translates to 210 MW and 263 MW respectively.

Case when ToU is Opt-In



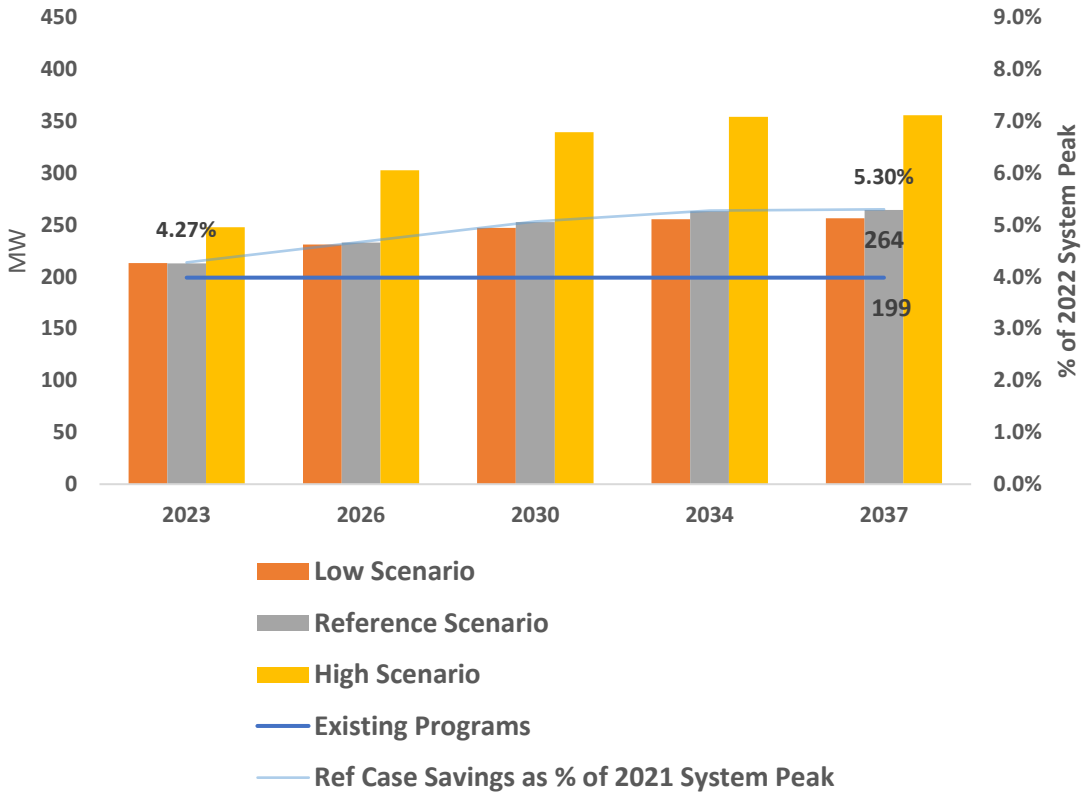
Case when ToU is Opt-Out



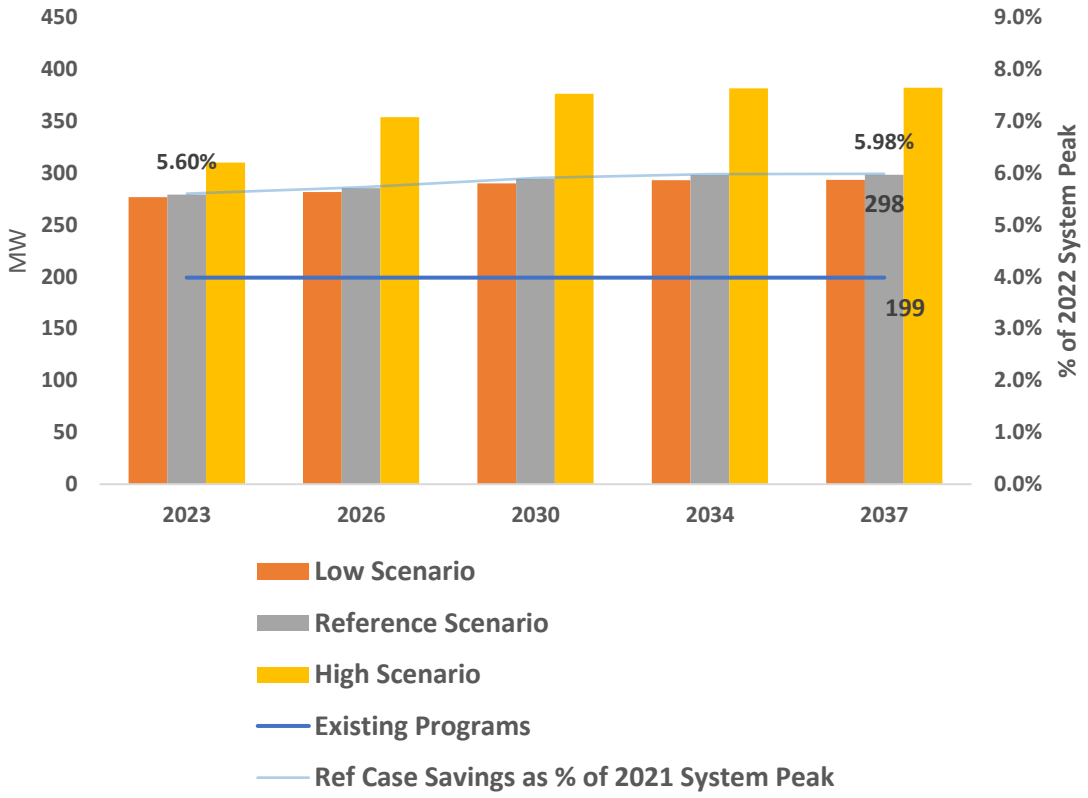
Achievable Potential C&I – Winter Demand Savings

The C&I savings contribute to savings that amount to 5.30% and 5.98% of system peak by 2037, for ToU opt-in and opt-out, respectively. This translates to 264 MW and 298 MW respectively and includes the current 199 MWs of savings from existing programs.

Case when ToU is Opt-In

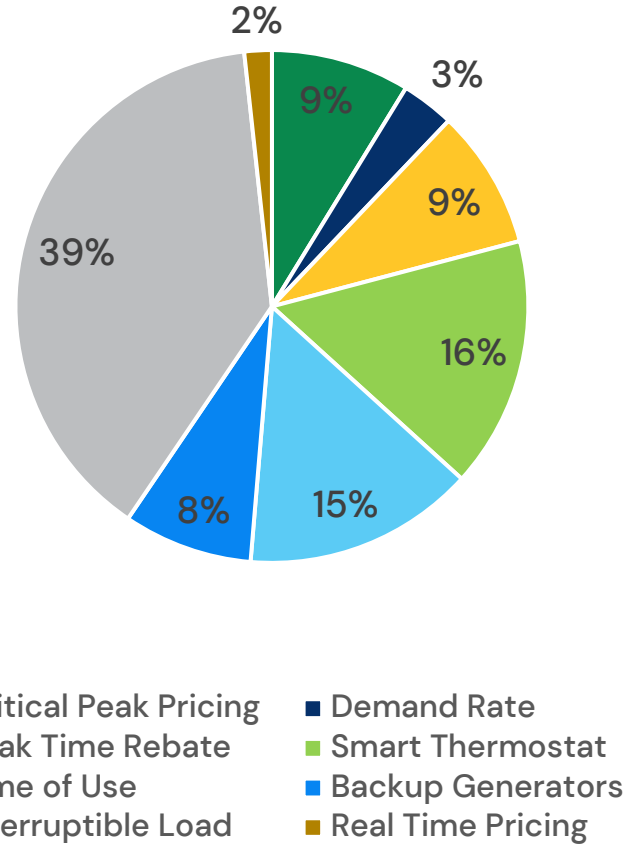


Case when ToU is Opt-Out

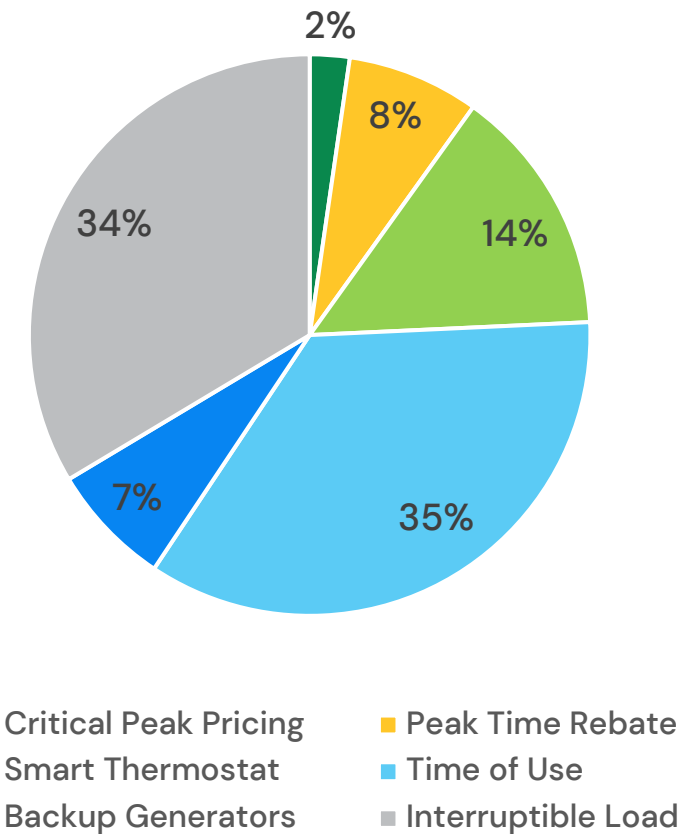


Achievable Potential – MW Savings, by Program, in 2037

Existing programs (interruptible, backup generation, time of use and demand rates) with forecasted participation have the potential to contribute to over 2/3rds of the savings in 2037. Among the new programs, smart thermostat program shows a significant contribution.



Reference Case when ToU is Opt-in

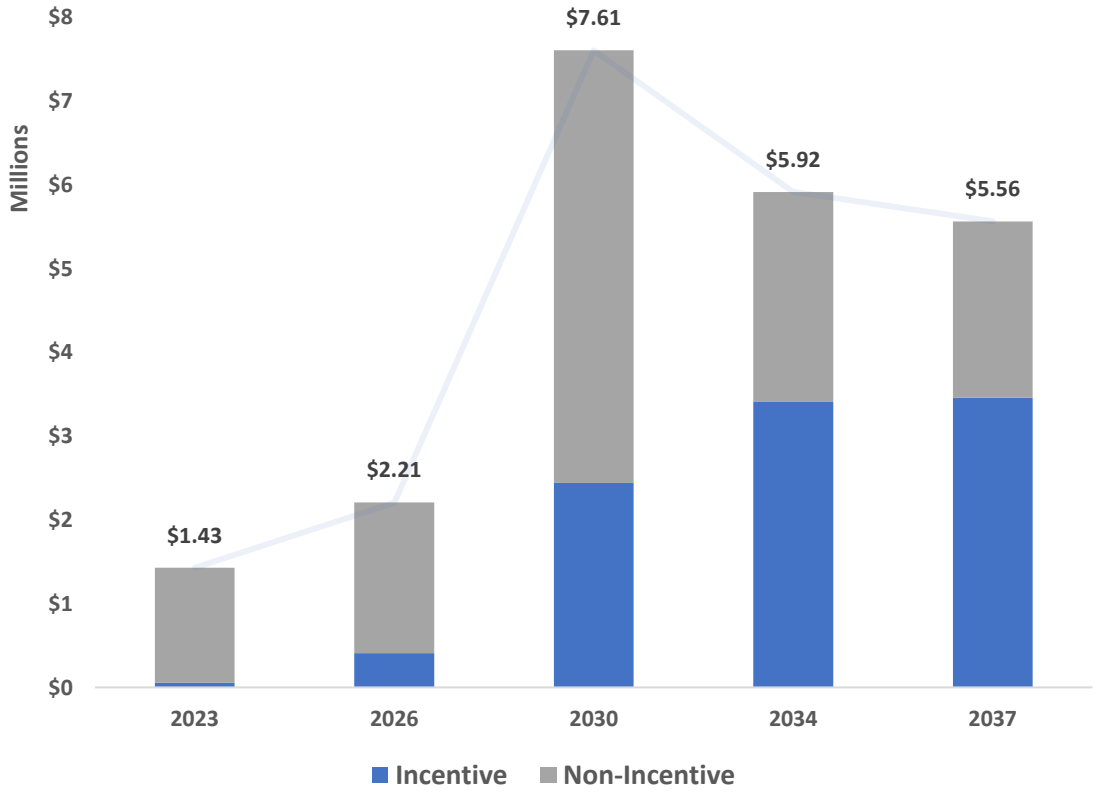


Reference Case when ToU in Opt-out

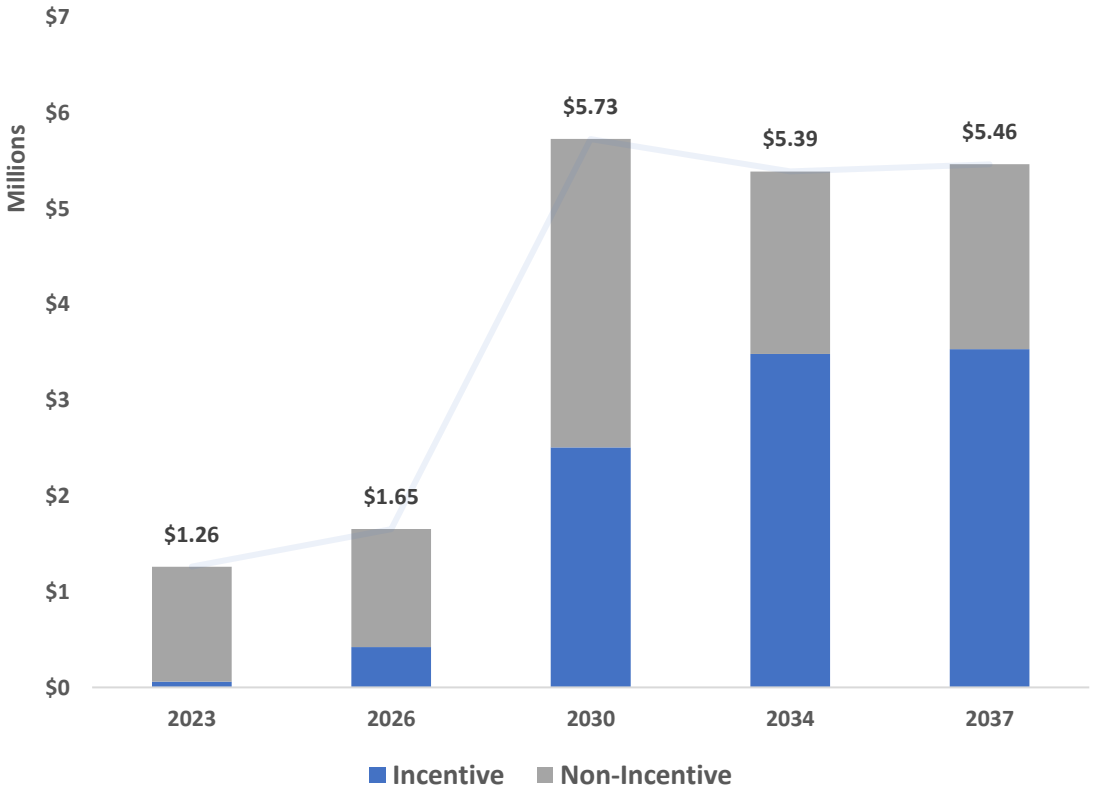
Program Costs – Residential Reference scenario

In the reference case, the residential program costs are expected to peak at $8 million before stabilizing at around $5.5 million towards 2037, in the scenario where ToU is modeled as opt-in. The same numbers are about $6 million and $5.5 million for the opt-out case.

Case when ToU is Opt-In



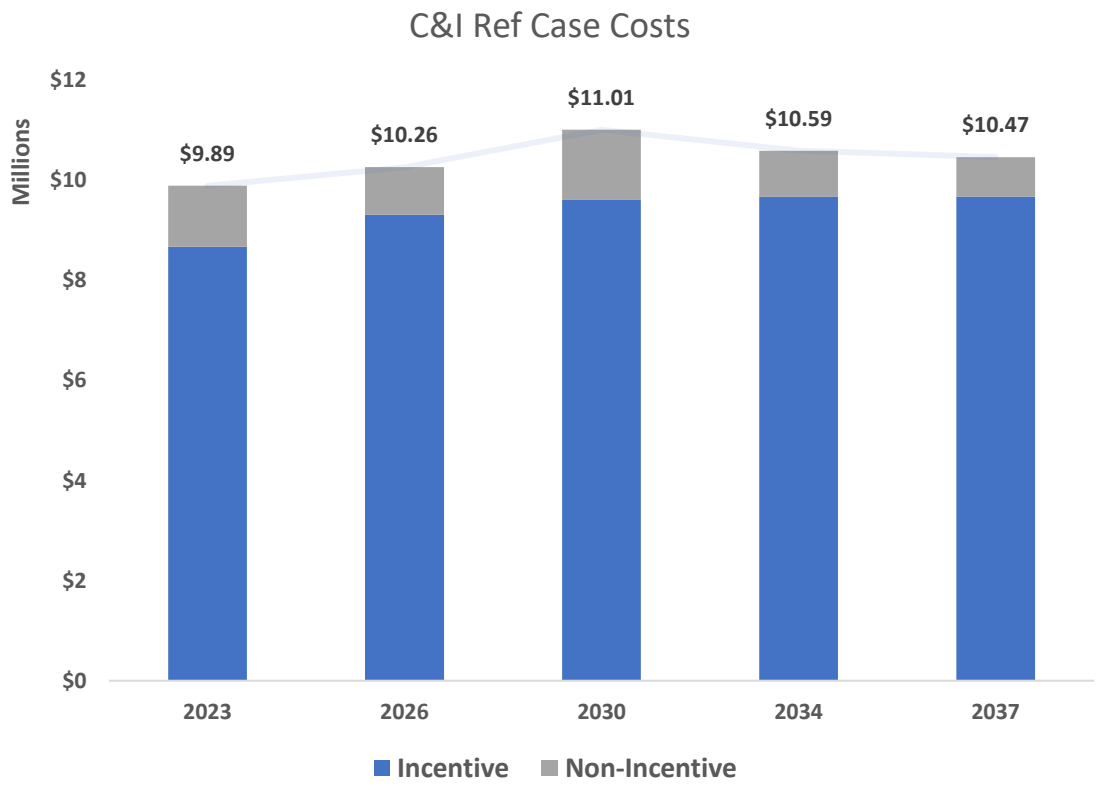
Case when ToU is Opt-Out



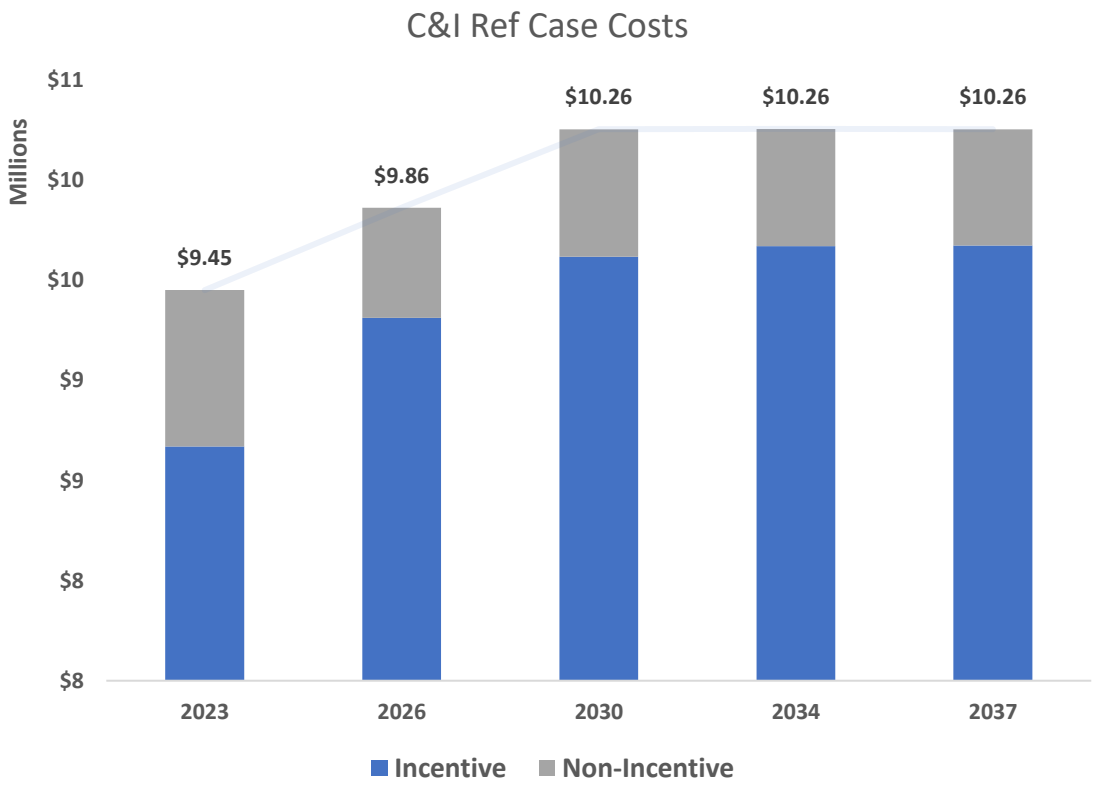
Program Costs – C&I Reference scenario

In the reference case, the C&I program costs are expected to peak at around $11 million before stabilizing at around $10.5 million towards 2037, in the scenario where ToU is modeled as opt-in. The same numbers are about $6 million and $5.5 million for the opt-out case.

Case when ToU is Opt-In



Case when ToU is Opt-Out



Note that these costs contain the incentives being paid out to current interruptible and backup generation customers, and constitute a major portion of the total costs forecasted as well

Achievable Analysis - Cost-Effectiveness Results (15-year)

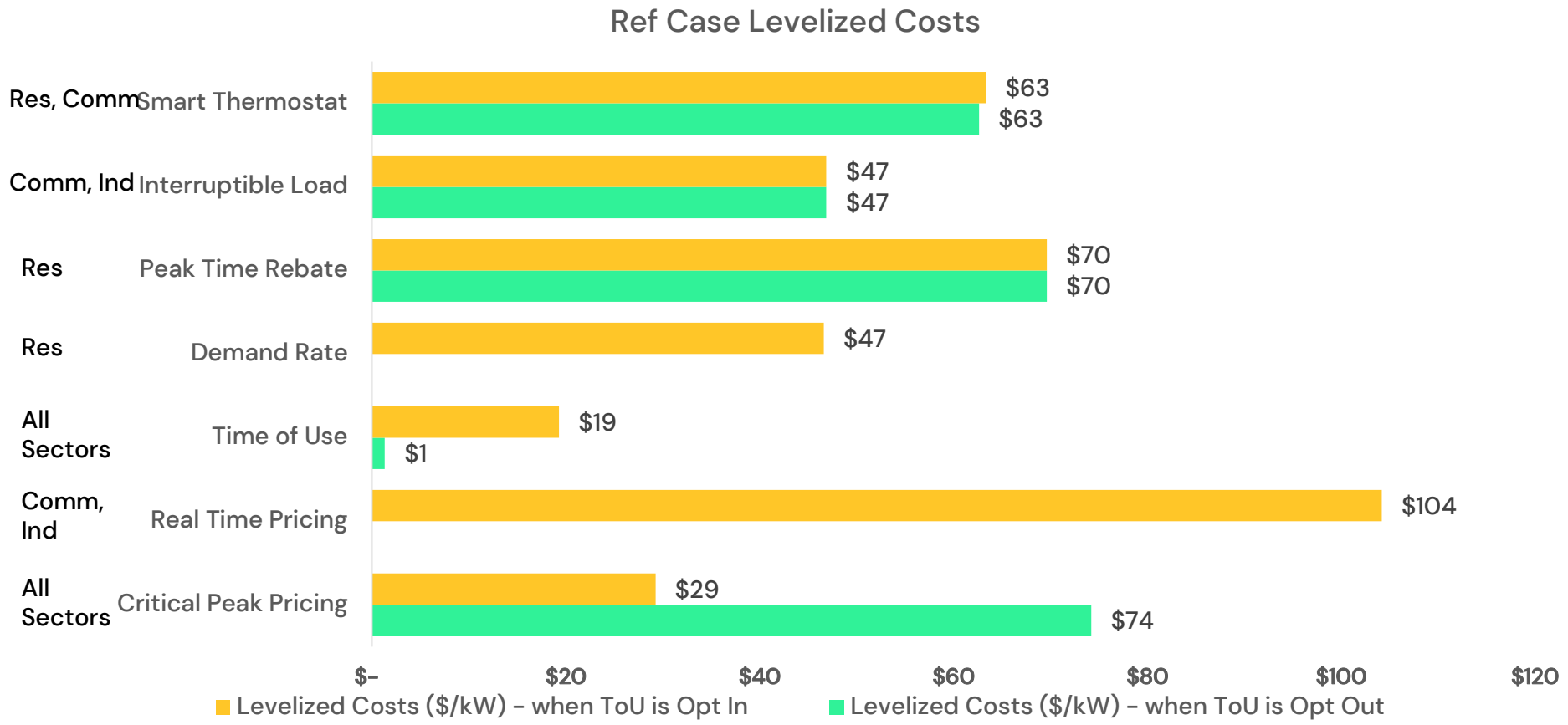
All programs except for real-time pricing, in the ToU opt-in case, clear a TRC of 1, in the reference case. Note that the program included here are the ones that cleared a TRC benefit cost ratio > 1 in the high case, when pre-achievable screening was conducted.

Sectors	Program	TRC Reference Case Benefit-Cost Ratio	
		ToU Opt In	ToU Opt Out
Res, Comm, Ind	Critical Peak Pricing	3.01	1.19
Res, Comm	Smart Thermostat	2.48	2.53
Comm, Ind	Interruptible Load	86.56	86.56
Comm, Ind	Real Time Pricing	0.85	-
Res, Comm, Ind	Time of Use	4.06	66.40
Comm	Backup Generators	NA	NA
Res	Demand Rate	1.89	-
Res	Peak Time Rebate	3.80	3.80

- High TRC for interruptible program is a result of the fact that a majority of costs for the interruptible program are incentive costs, which are not included in the TRC test. A more representative test for this program is the UCT test.
- ICF considered no administrative costs for backup generators, and hence the TRC ratios are not reported
- The difference in TRC ratios between the two columns result from eligible stock accounting after deployment of the ToU program in the two delivery modes – opt-in and opt-out.

Achievable Potential Levelized Costs – Reference Case

Levelized costs are calculated as the ratio of '*net present value of the utility costs to run the program'* to *'the net present value of the MW savings'*, over 15 years i.e., the study period.



Questions? Please use the Chat function

Guidehouse
Outwit Complexity

2023 IRP Forecast: DESC Electric Vehicle & Charging Infrastructure

IRP Advisory Group

December 2022

EV Market Fundamentals

Significant growth in Electric Vehicles is expected due in part to accelerating demand, increased model availability, and strong political, environmental, and regulatory support.

Macros-level drivers are leading a fundamental shift and acceleration of EV adoption. The combination of the ICEV ban and automaker commitments results in a significantly increased PEV outlook.

Market Drivers & Support

- **Vehicle Availability & Brand Transformation:** Vehicle automakers continue to press forward with aggressive goals in support of an all-EV future. A handful of automakers have announced goals to reach 40-50% EV model sales by 2030.
- **ICE Vehicle Ban (State Policy):** The California ICE Vehicle (ICEV) Ban requires, all new cars and passenger trucks sold in California be zero-emission vehicles by 2035. We expect most ZEV states to adopt this ban into state policy, and it represents a fundamental shift to the future EV landscape. This policy shift represents the biggest driver of change in vehicle adoption forecast versus previous forecasts.
  - ➢ *South Carolina: ICE availability to follow non-ZEV state assumptions with **model availability dropping to ~25% by 2035***
- **Federal Policy:** Strong federal vehicle and infrastructure incentives (e.g., IRA, IIJA) NEVI will boost PEV sales across light-, medium-, and heavy-duty segments and continue to pull forward customer demand and decrease “range anxiety” hurdles.
  - ➢ *South Carolina: NEVI budget for South Carolina used to estimate incentive amounts*

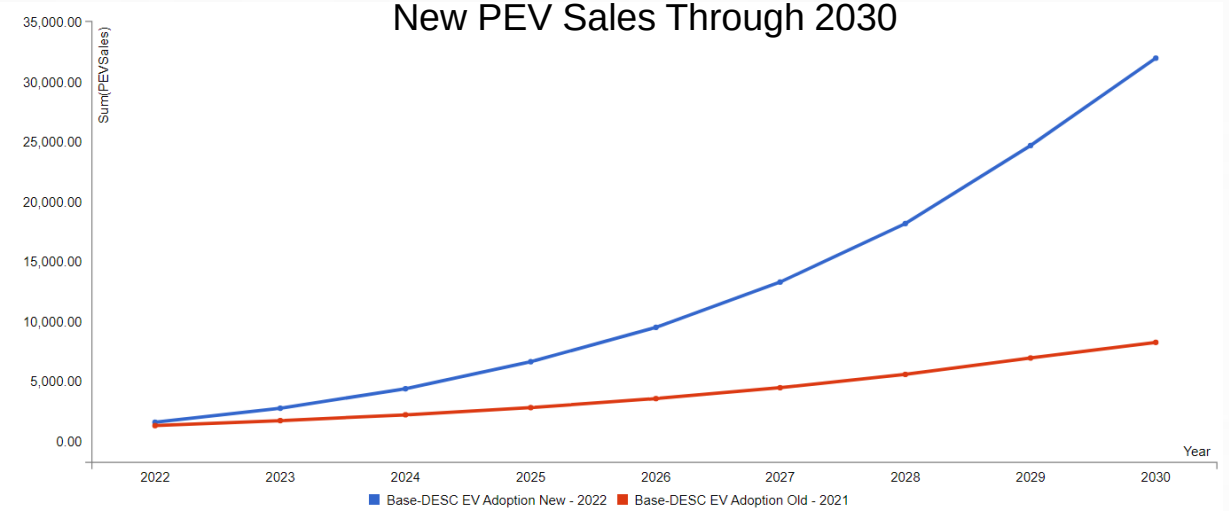
Market Constraints & Headwinds

- **Supply Chain:** Although there are some near-term supply-chain limitations, especially in chips, batteries, other component parts, EV growth will be hindered short term. Long term supply chain challenges will subside due to increased production and component availability supporting projected EV growth.
- **Economic Pressures:** Near-term economic slowdown (e.g., rising interest rates, increase cost of capital, investor uncertainty) provides potential slow-down in production, but that slowdown is offset by pinned up demand for EVs. The positive cost of ownership for typical EV owners also provides a positive influence in EV market growth.

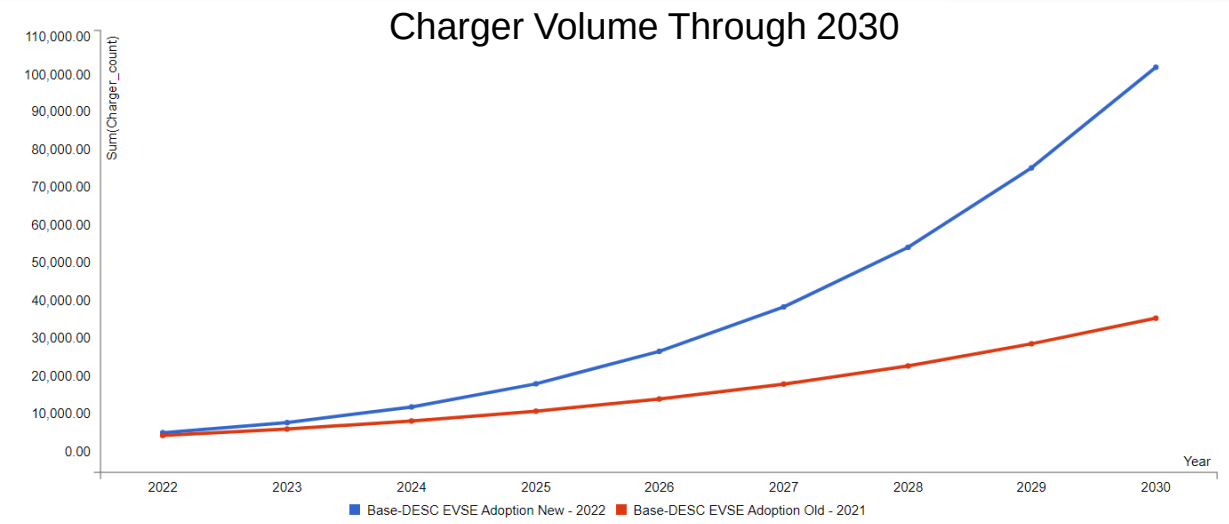
Comparison to Previous Market Forecast (2021)

Growth in adoption forecast relative to previous 2021 forecast is primarily driven incremental policy (CA ICE Ban) and automaker announcement impacts

- PEV sales for LDVs and MHDVs expected to reach ~32,000 by 2030
  - 3.2x growth relative to 2021 results
  - True impacts of IRA expected to kick in by mid-late 2020s when more OEMs align with battery production & minerals restrictions
- Total PEV population for LDVs and MHDVs expected to reach ~115,000 by 2030
  - 3x growth relative to 2021 results



- Total EVSE volume expected to reach ~102,000 by 2030
  - 3x growth relative to 2021 results
- Total L2 and DCFC volume expected to reach ~64,000 by 2030
  - 4x growth relative to 2021 results



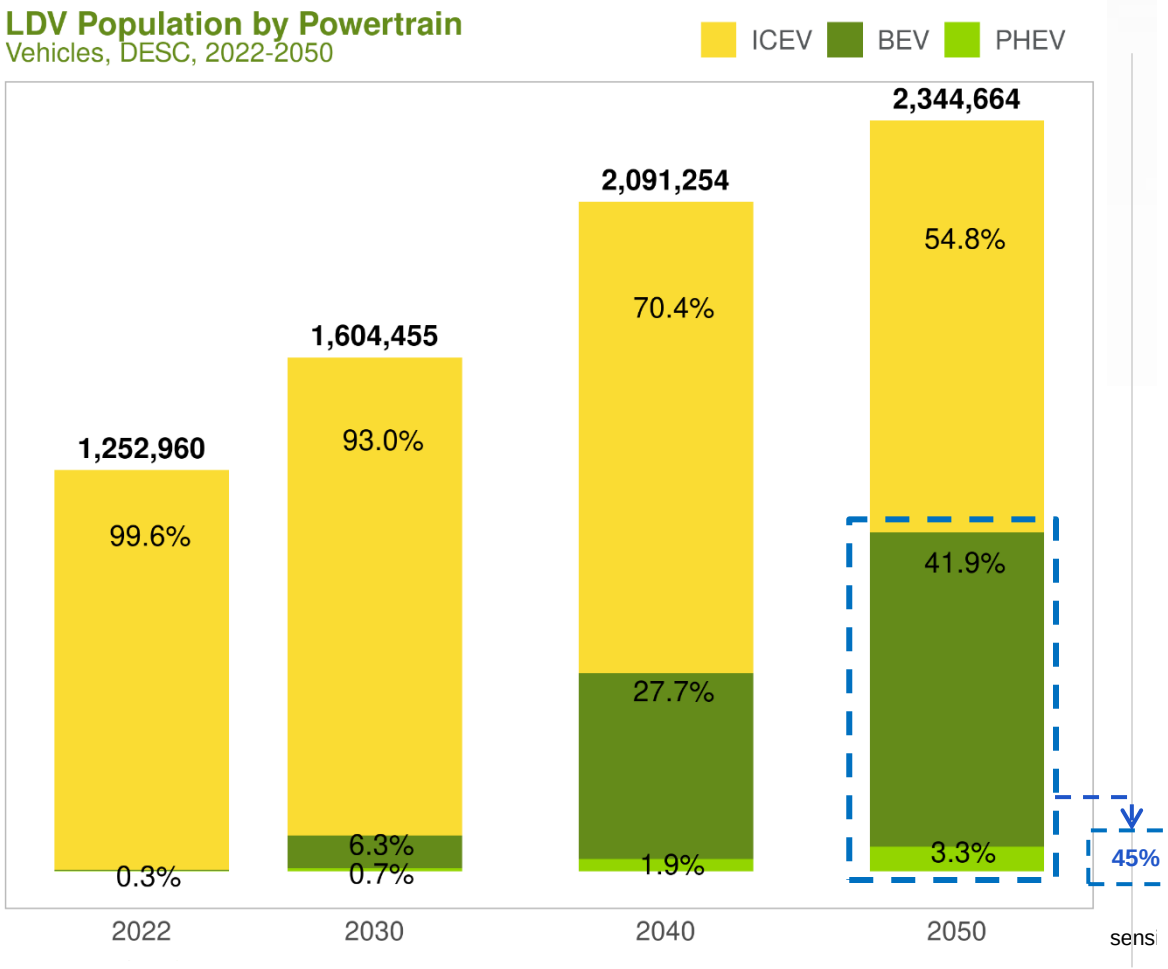
PEV Population expected to grow 42% CAGR through 2030
1M Vehicles on the road by 2050

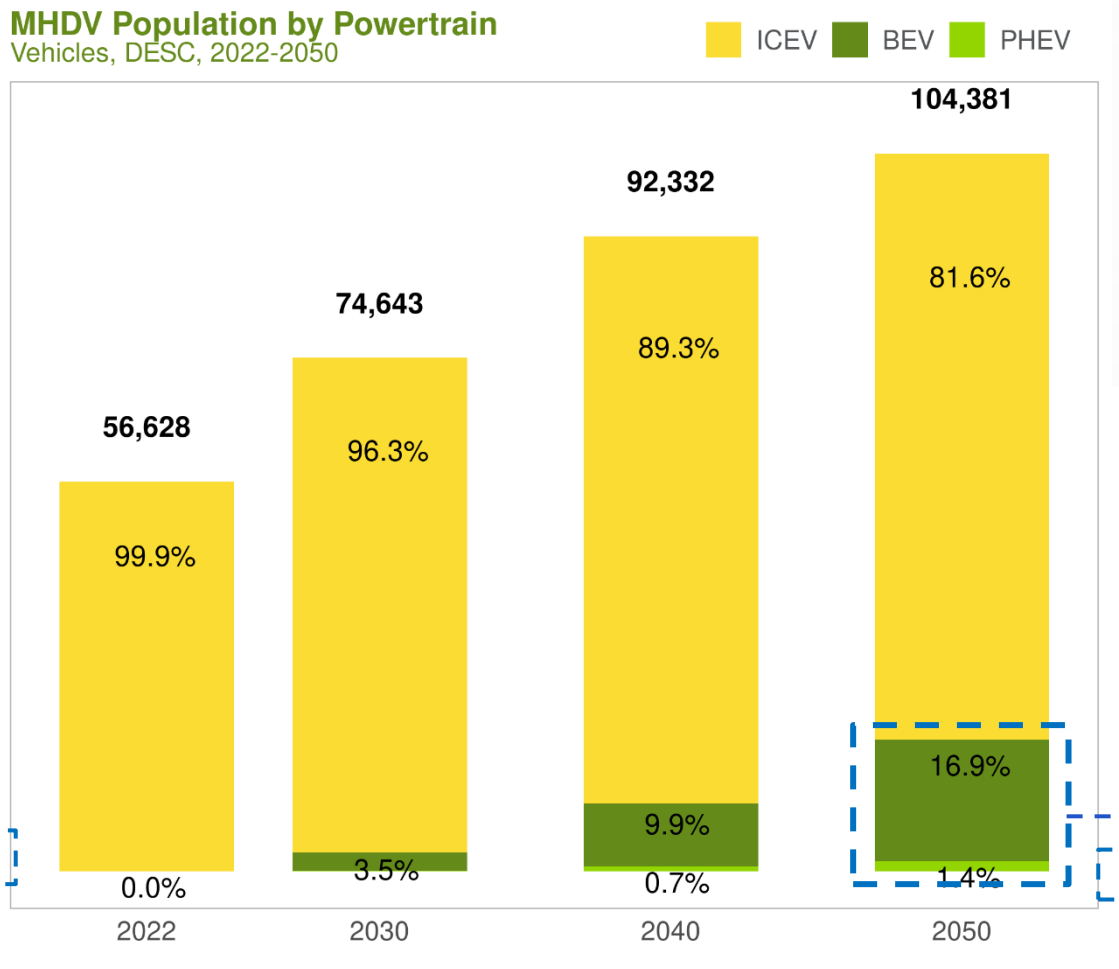
- BEV and PHEV are expected to show **44% penetration of total vehicle population** by 2050
- BEV and PHEV are expected to show **45% penetration of total LDV population** by 2050
- BEV and PHEV are expected to show **18% penetration of total MHDV population** by 2050

84% of sales market share by 2050

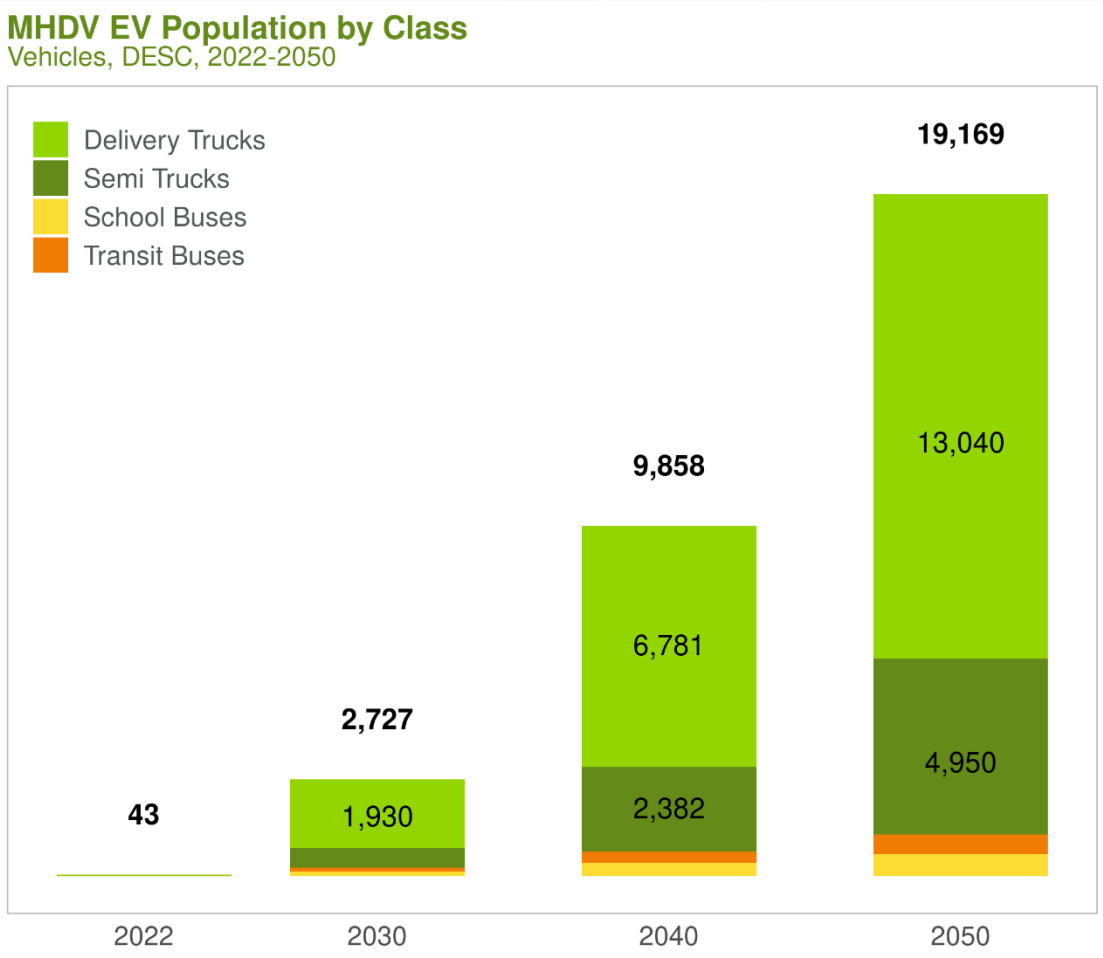
86% of sales market share by 2050

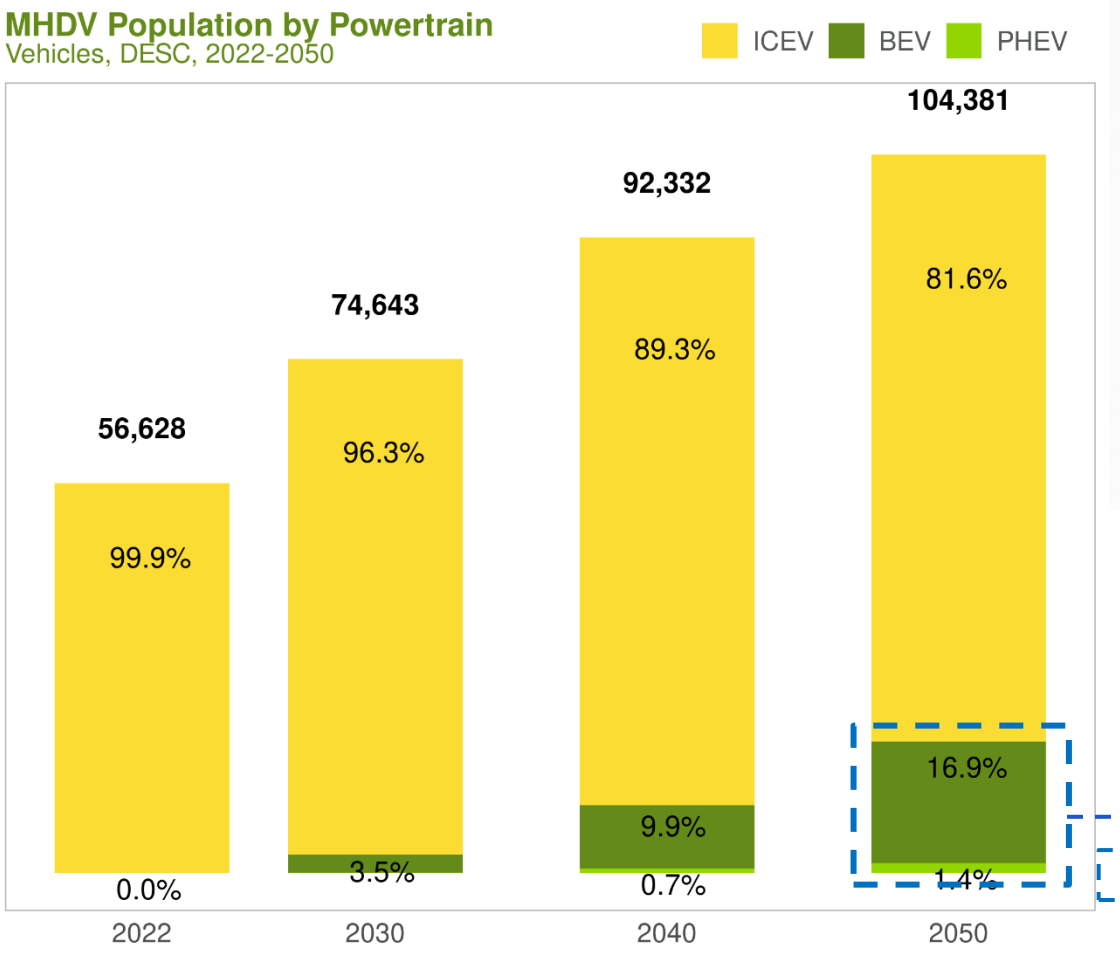
42% of sales market share by 2050





Over 19,000 MHD EVs expected by 2050 (~18% penetration)



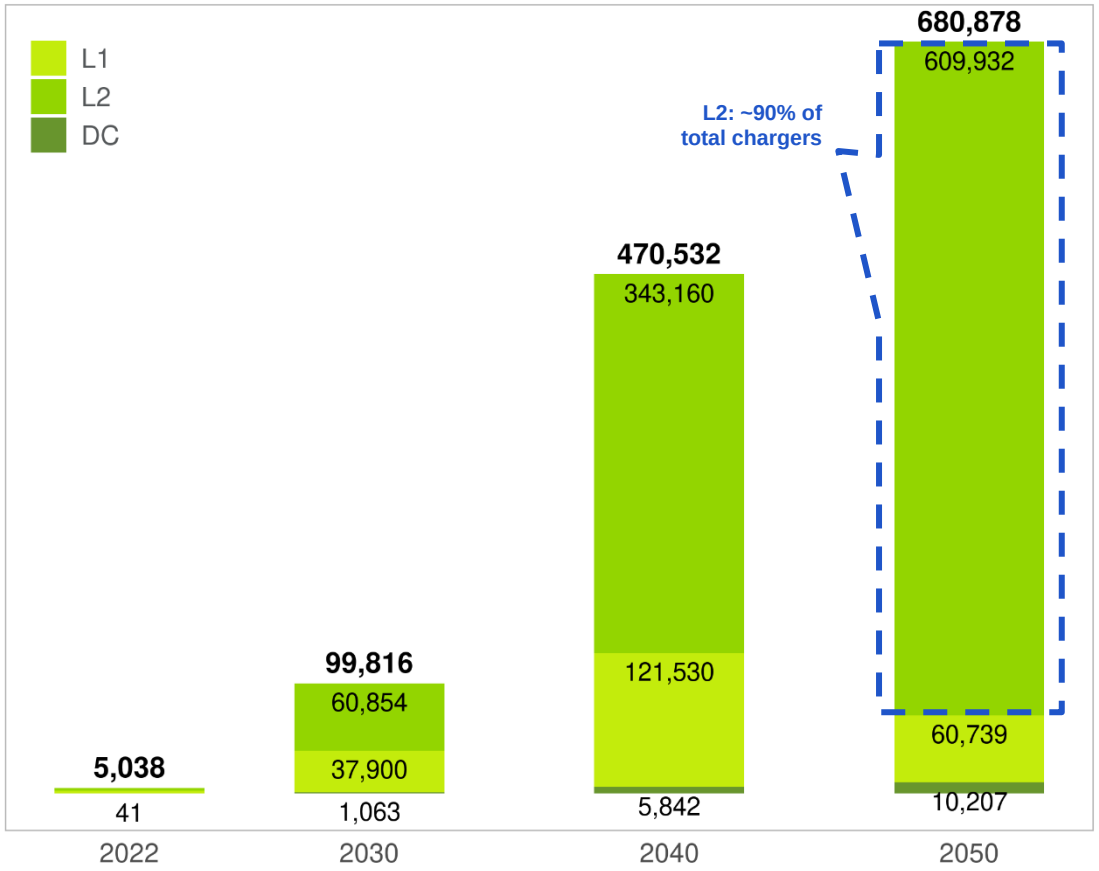


LDV & MHDV charger needs expected be driven by L2 and DCFC

- Total charger volume in 2050 expected to be **87% L2, 9% L1 and 4% DCFC**
- LDV charger volume in 2050 expected to be **90% L2, 9% L1 and 1% DCFC**
- MHDV charger volume in 2050 expected to be **98% DCFC and 2% L2**

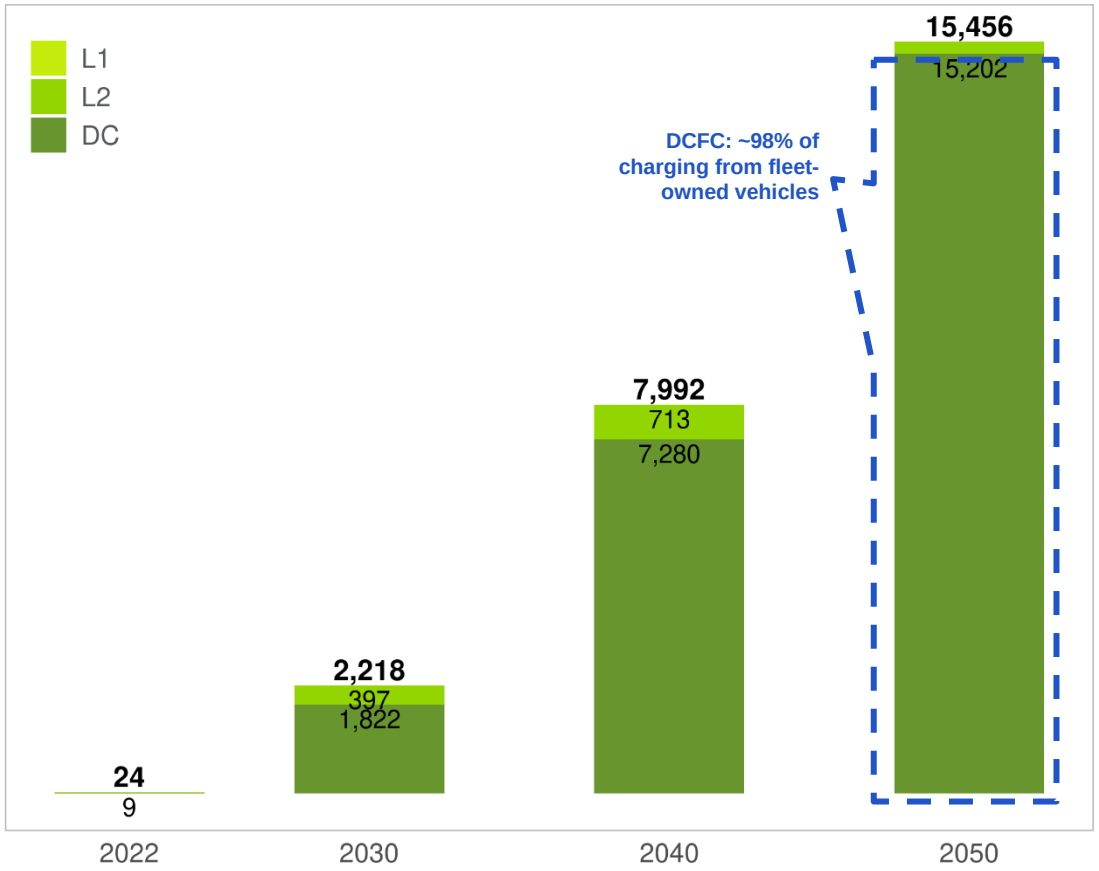
LDV EVSE By Technology

Charger Count, DESC 2022-2050



MHDV EVSE By Technology

Charger Count, DESC 2022-2050

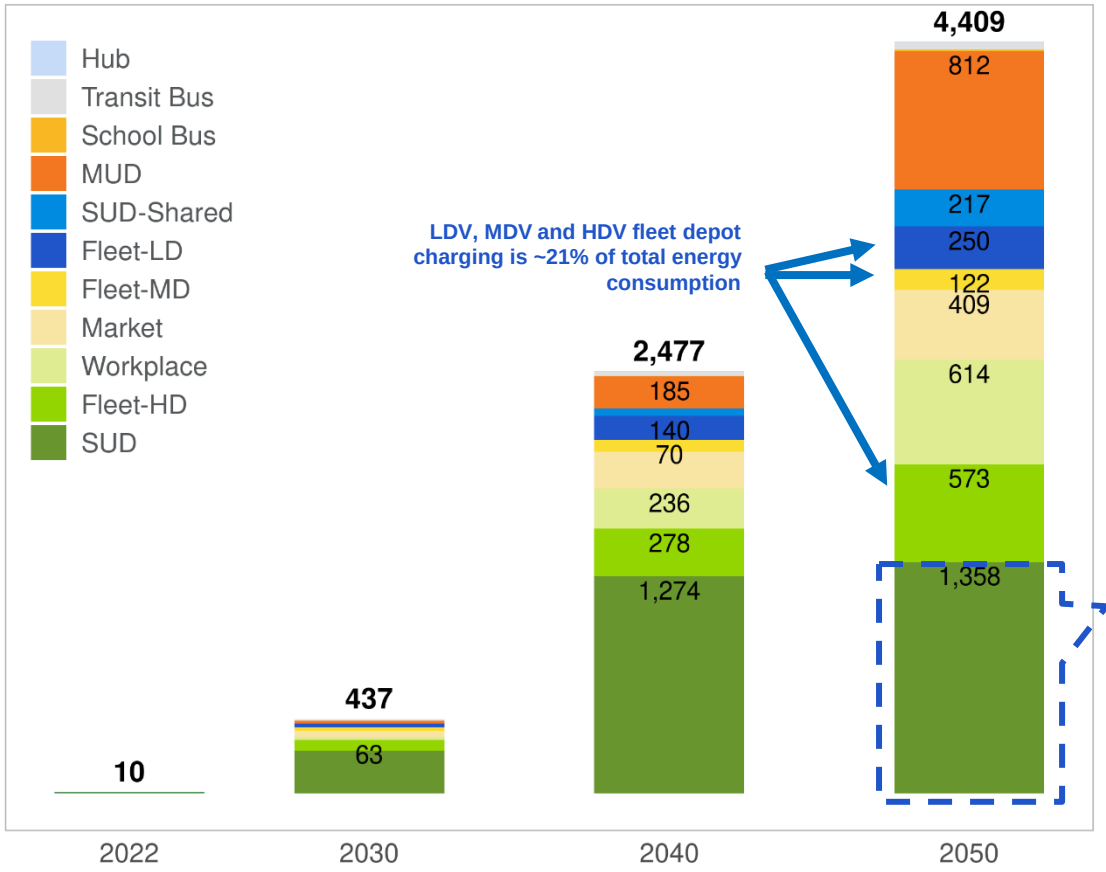


"Home-base" charging to drive EV Load & energy consumption, DCFC will have disproportionate impacts

- Annual energy consumption expected to reach **~4TWh** in 2050 with peak load reaching almost **1GW** in 2050, **700MW** Coincident peak
- Single Unit Dwelling (SUD) charging and fleet depot charging (Fleet-LD, Fleet-MD, Fleet-HD) drive annual energy consumption at **31%** and **21%** respectively
- Peak load is expected to have highest contribution from **L2 (68%)** and **DCFC (27%)** technologies

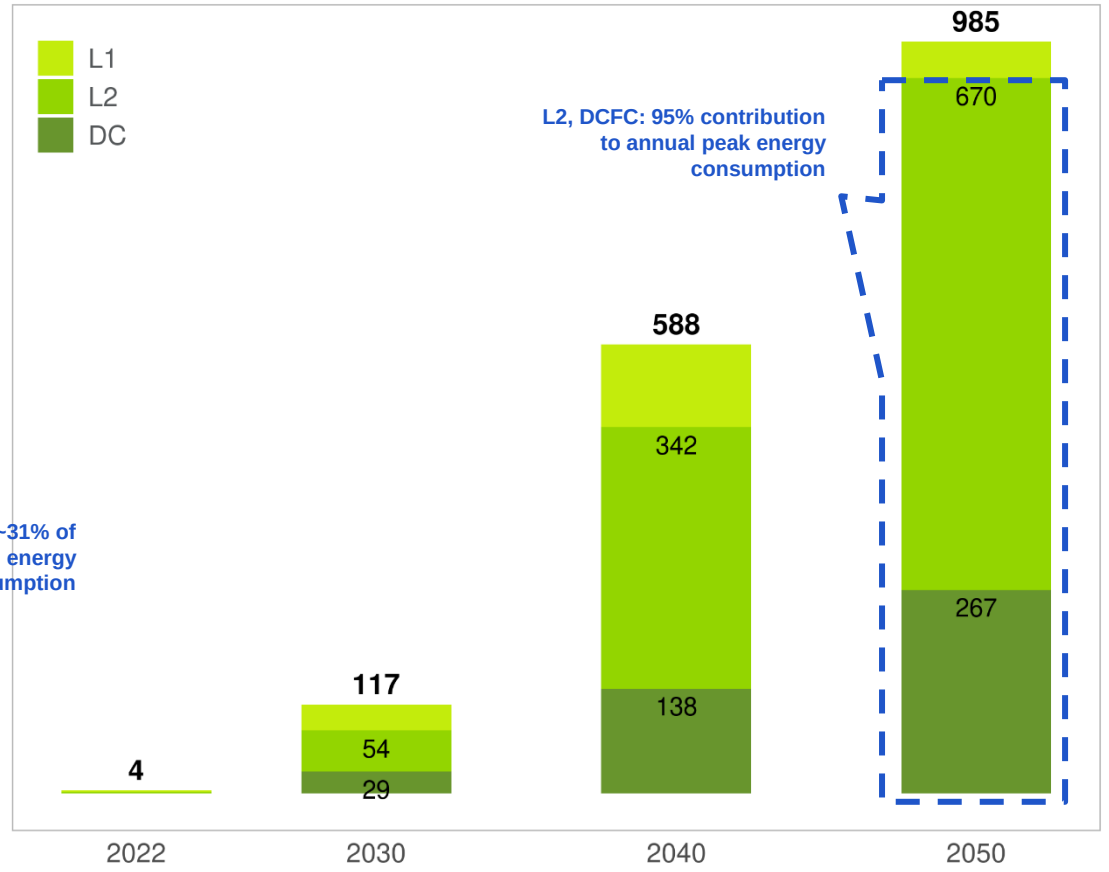
Annual Energy Consumption By Use Case - ALL

Impacts (GWh), DESC 2022-2050



Contribution to Annual Peak Load By Technology - ALL

Impacts (MW), DESC 2022-2050

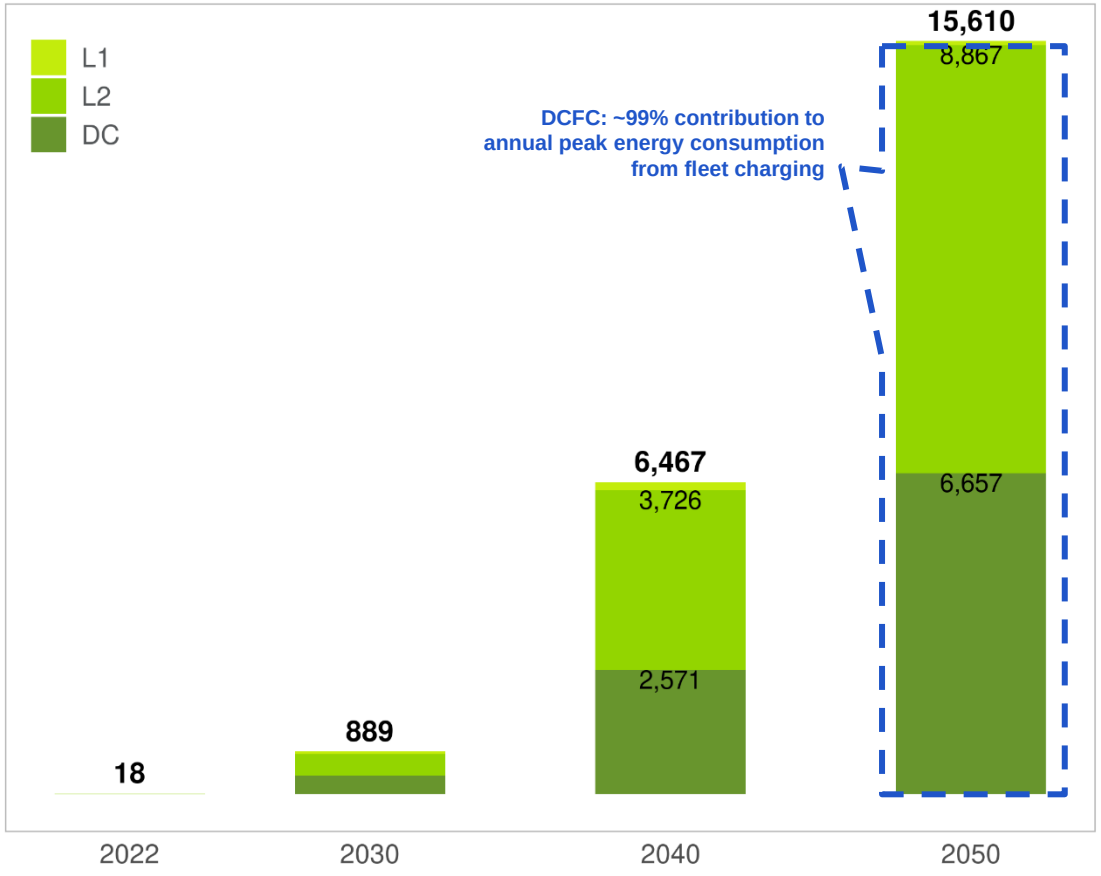


Capacity (889 MW) is ~8x > peak load (117 MW) in 2030

Single Unit Dwelling (SUD) charging drives installed MW capacity for all charging in 2050 (~50%).

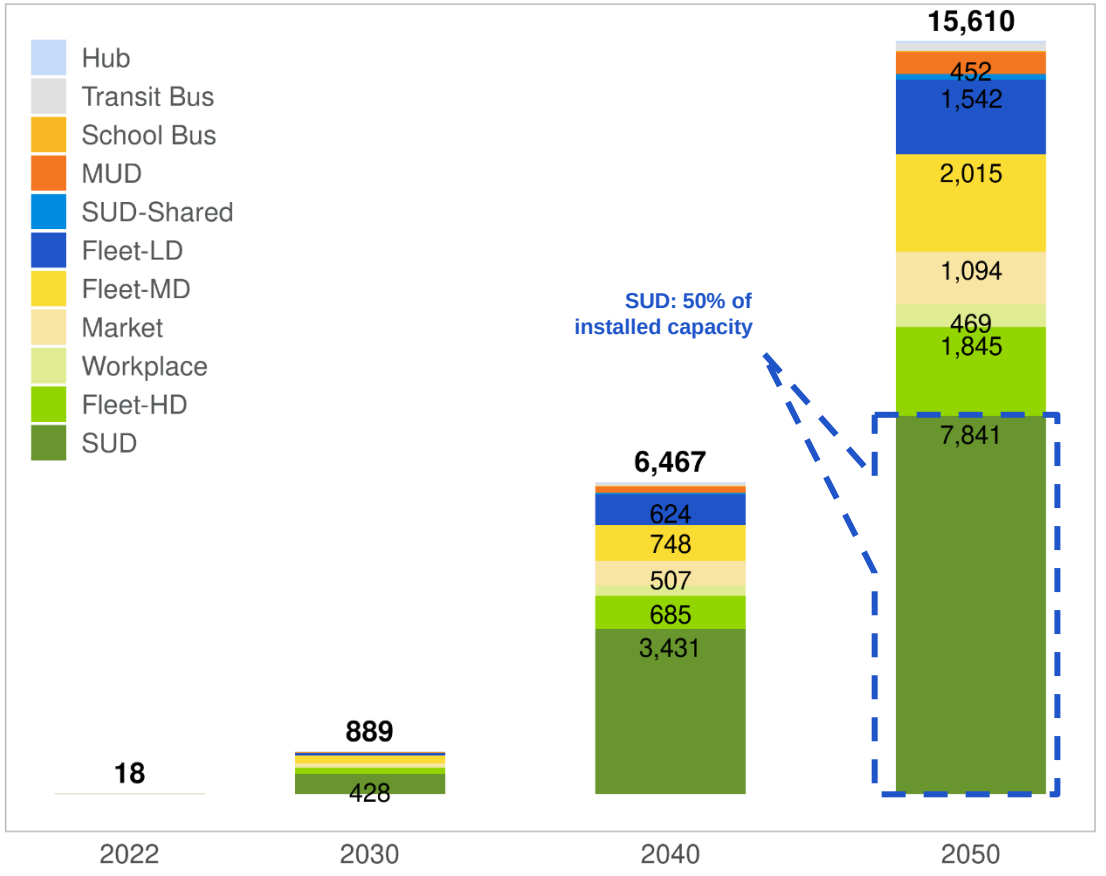
Rated Capacity By Technology - ALL

Impacts (MW), DESC 2022-2050



Rated Capacity By Use Case - ALL

Impacts (MW), DESC 2022-2050



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Dominion South Carolina Stakeholder Meeting
Resource Adequacy Studies

Presented By
Astrapé Consulting

12/8/2022

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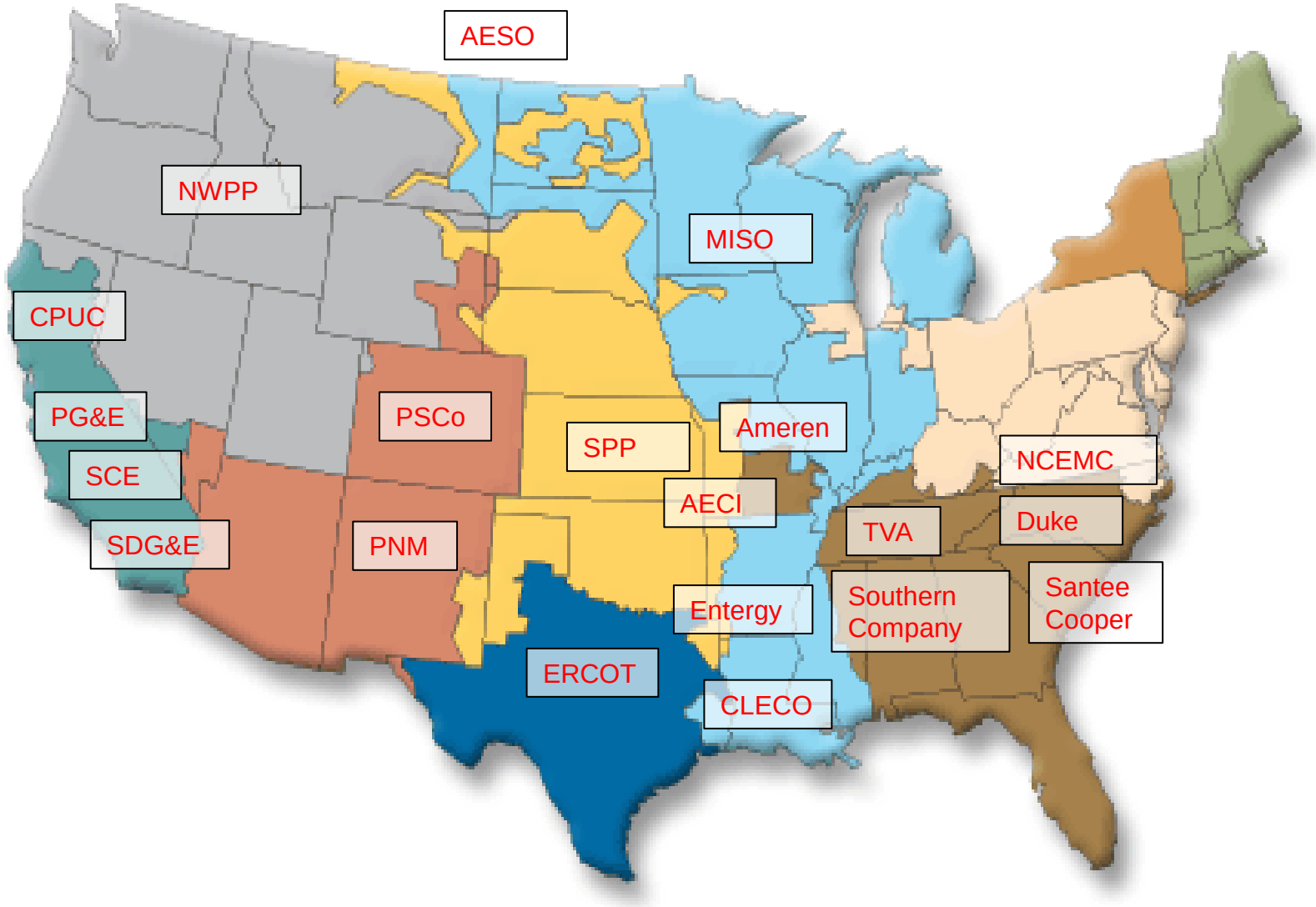
Topics of Discussion

- **Planning Reserve Margin (PRM) Study**
- **Solar and Storage Effective Load Carrying Capability (ELCC) Study**

Astrapé's SERVM Model has been utilized in the following areas across the U.S.



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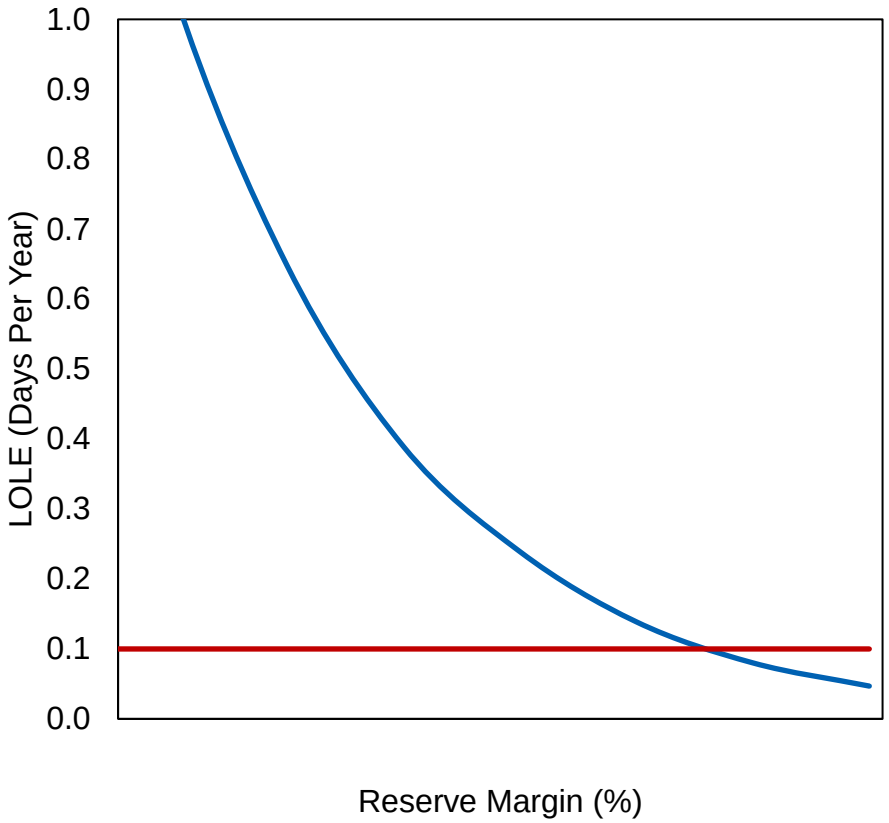
Planning Reserve Margin Study

PRM Study Methodology

- Planning Reserve Margin (PRM) - defined as the percentage by which the total capacity of system resources exceeds the forecasted peak load
- Loss of Load Expectation (LOLE) – number of days in a year that customer load is shed
- Methodology - Determine the reserve margin that achieves LOLE of 0.1 days/year; Also known as the 1 day in 10-year standard across the electric industry
- Perform sensitivities around key drivers



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SERVM Framework

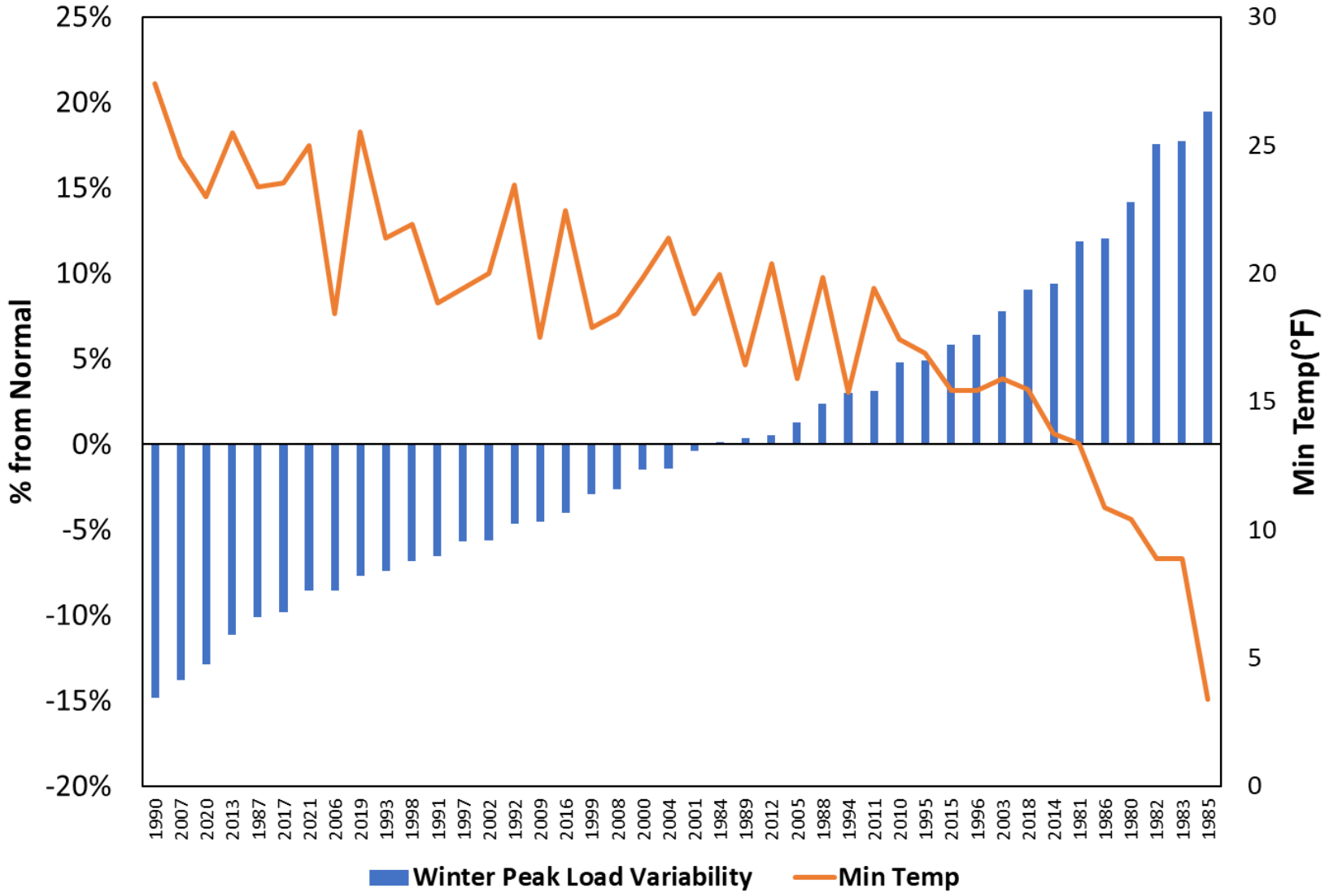
- **Capture Uncertainty in the Following Variables**
  - Weather: 42 years of weather history (1980-2021) with equal probability of occurrence
    - ➢ Impact on Load and Resources (hydro, wind, PV, temp derates on thermal resources)
  - Economic Load Forecast Error: Distribution of 5 points with varying probabilities of occurrence
  - Unit Outage Modeling (50+ iterations for each load scenario)
- **Multi-Area Modeling – Pipe and Bubble Representation**
- **Total Base Case Scenario Breakdown**

42 **Weather Years** (Equal Probability)	x	**5** **LFE Points** (Associated Probabilities)	=	**210** **Load Scenarios** (Associated Probabilities)
210 **Load Scenarios**	x	**50** **Unit Outage Draws**	=	**10,500** **8760 Hour Simulations**

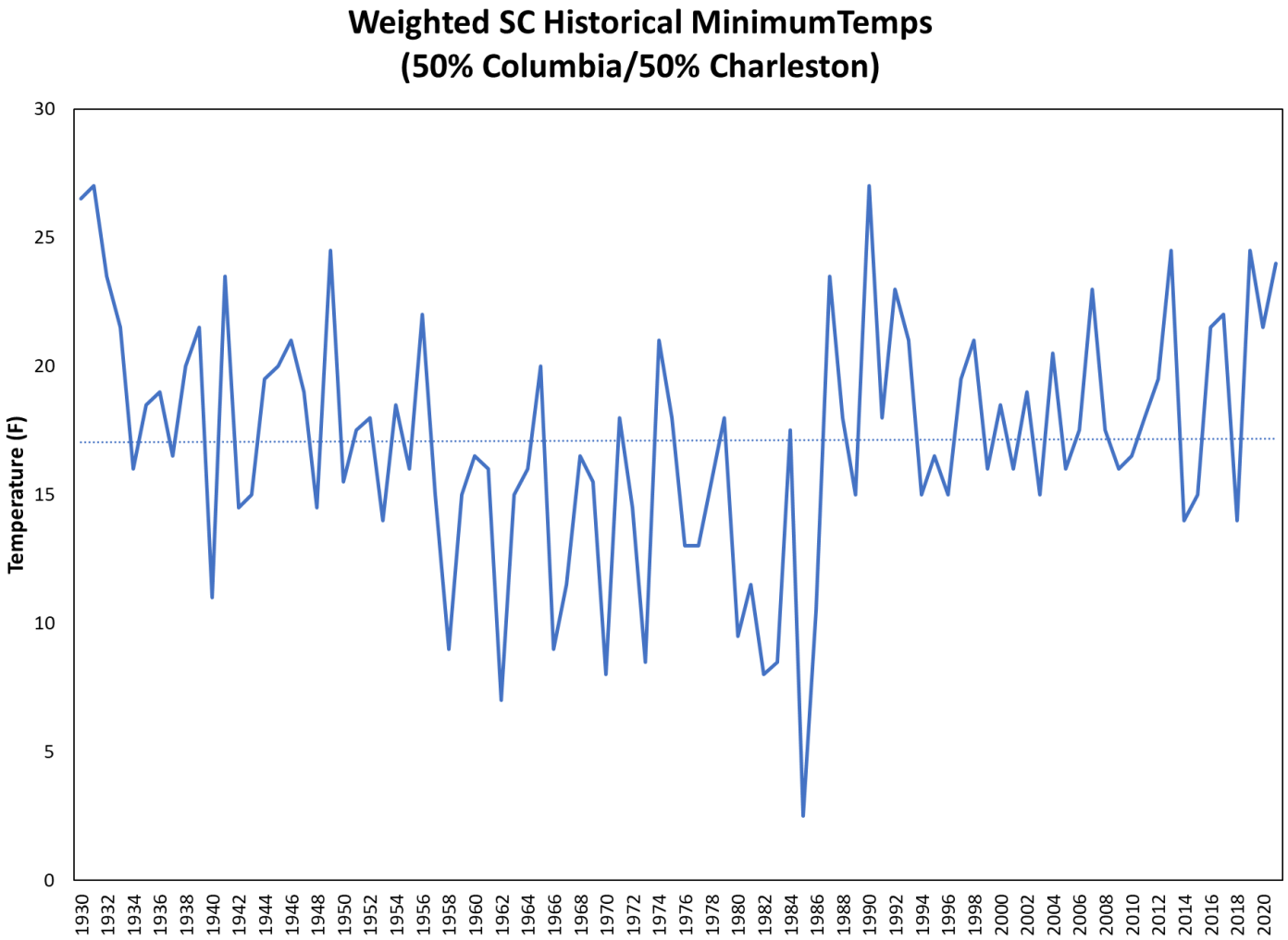
Major Study Parameters

- **Study Year: 2026**
- **Historical Weather Years: 1980-2021**
- **Regions (Balancing Authority Areas) Modeled**
  - DESC
  - SOCO (Southern Company)
  - Duke (Duke Energy Carolinas)
  - DEP (Duke Energy Progress)
  - Santee Cooper
- Maintain minimum regulating reserves of 45 MW during firm load shed events
- **Target LOLE:** 0.1 Days/Year = 1 firm load shed event in 10 years

Peak Winter Load Variability by Weather Year



Historical Minimum Temperatures



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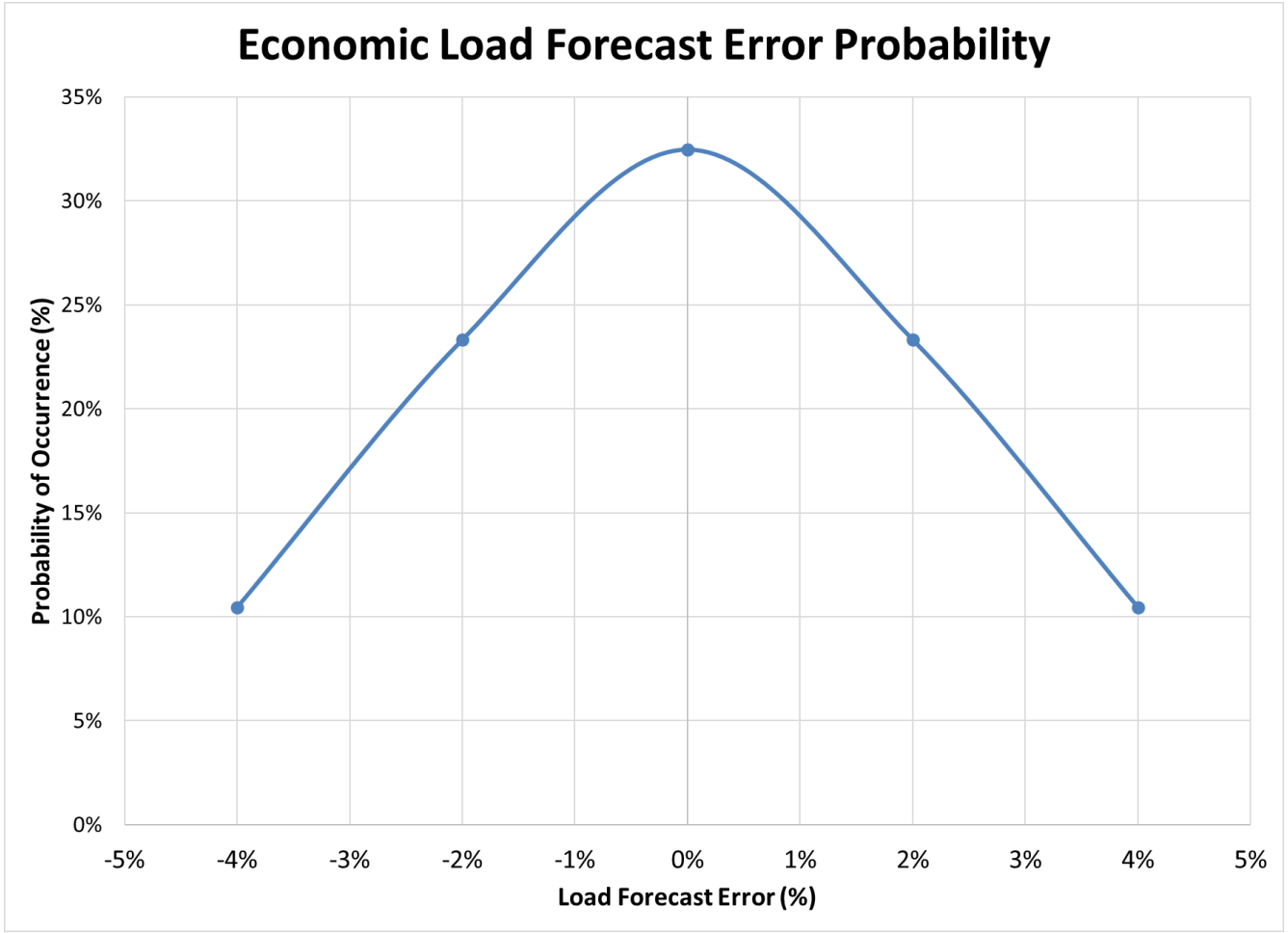
Load Forecast Uncertainty and Forward Period

- Non-weather load forecast error increases with forward period
- Each weather shape simulated with each LFE and associated probabilities
- Represents 4 year ahead LFE because it generally takes 3-5 years to approve, permit, and build a new power plant.



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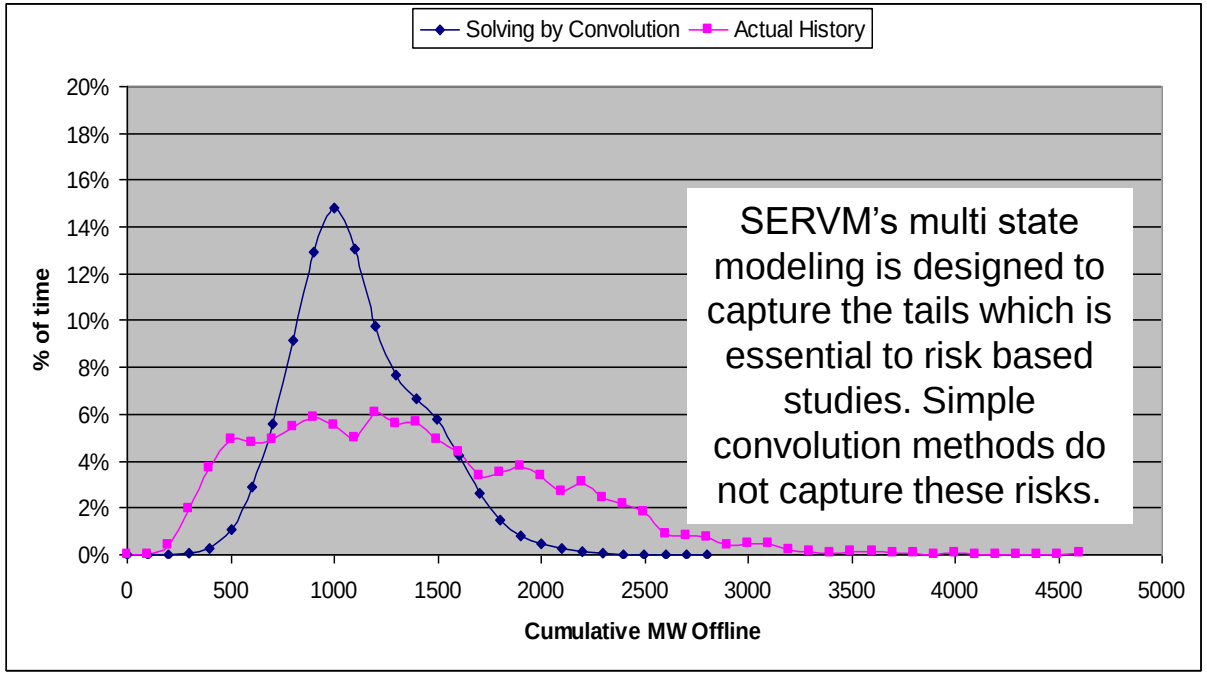
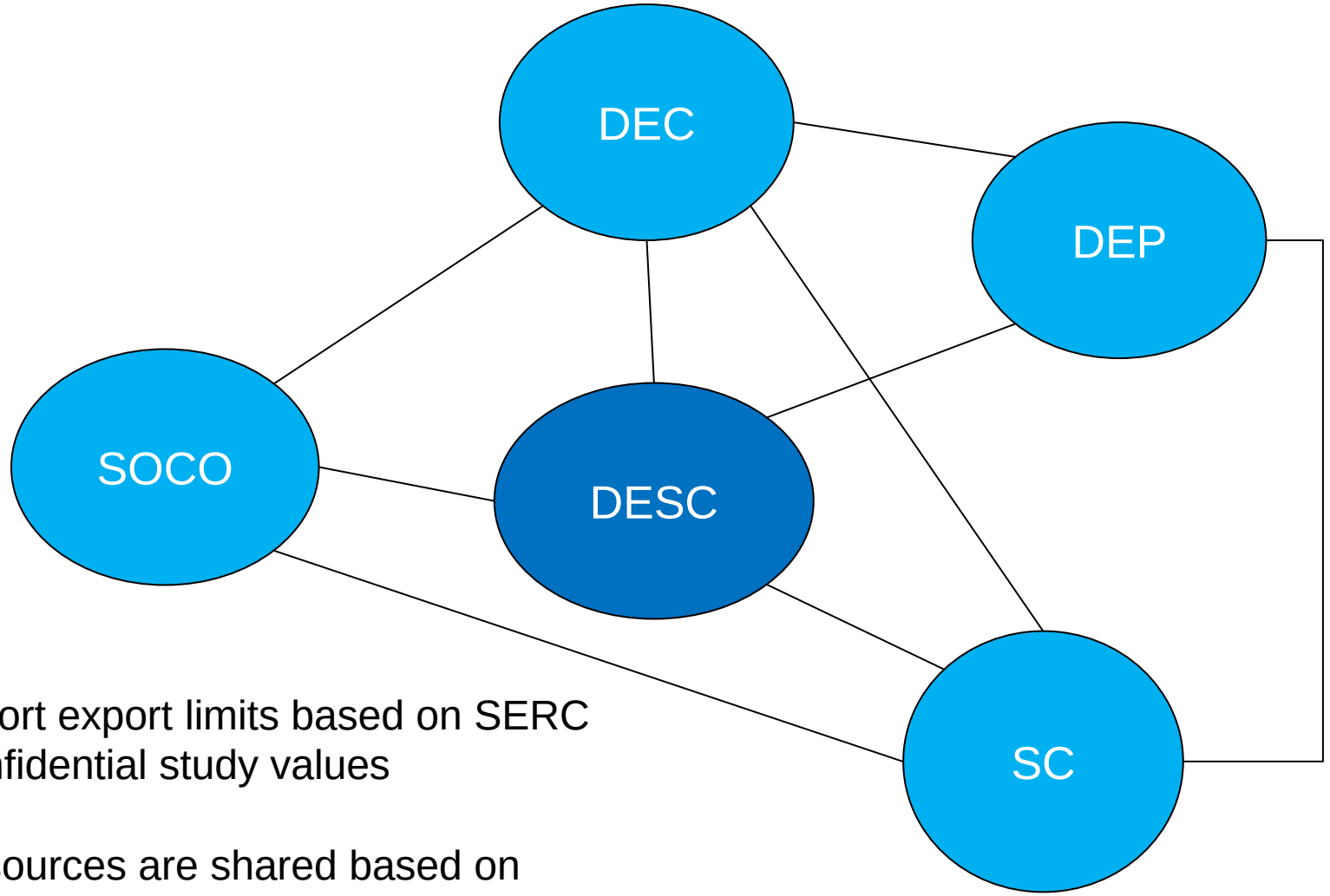
Unit Outage Modeling

- **Full Outages**
  - Time to Repair
  - Time to Failure
- **Partial Outages**
  - Time to Repair
  - Time to Failure
  - Derate Percentage
- **Maintenance Outages**
- **Planned Outages**
- **Created Based on Historical GADS Data**
- **No Cold Weather Correlated Outage Penalty Modeled as conventional fleet performed well historically**

- Multi State Frequency and Duration Modeling vs Convolution



System Configuration



Import export limits based on SERC Confidential study values

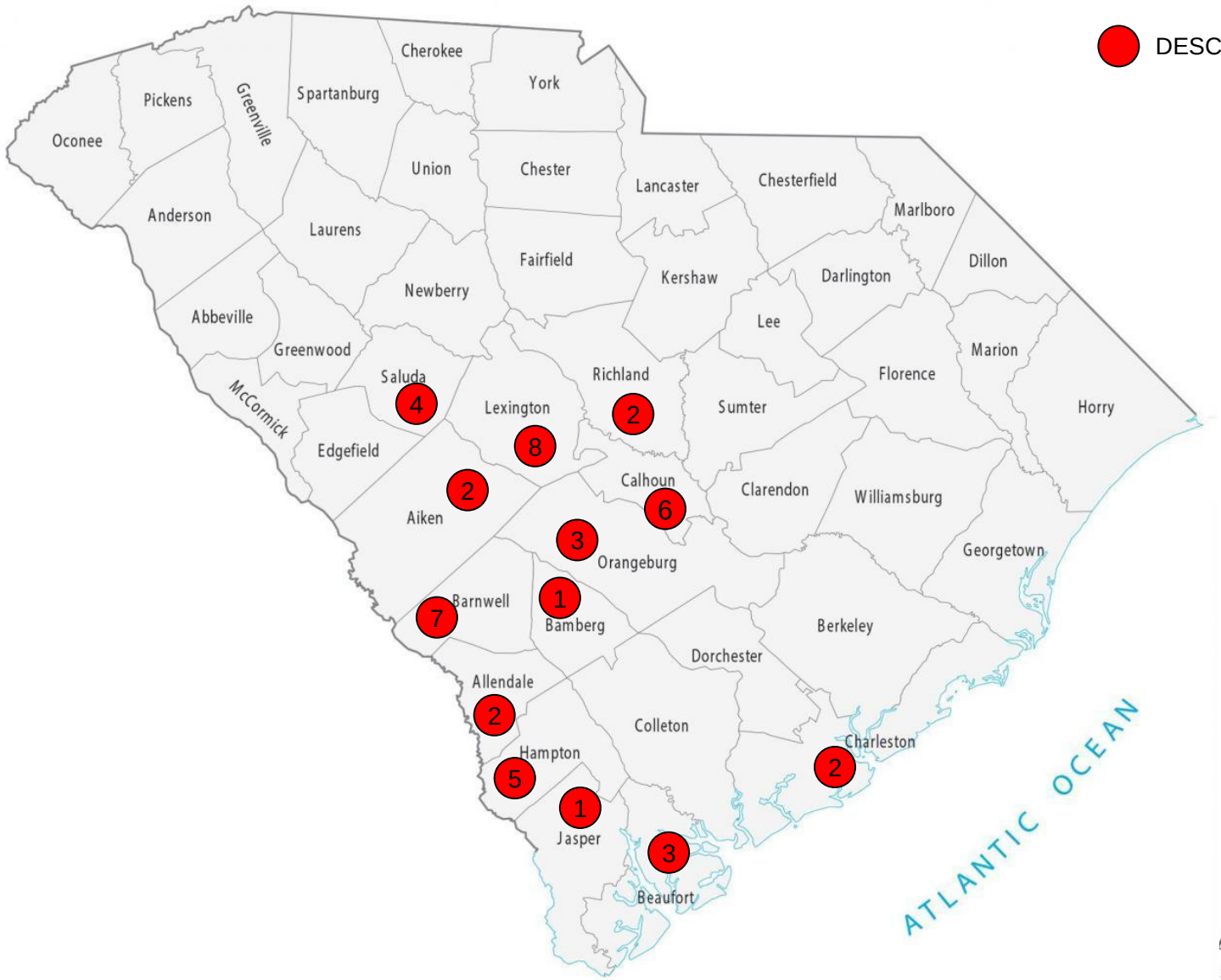
Resources are shared based on economics and subject to transmission limits

Hydro and Solar Modeling in SERVM

- **Hydro - Aggregate Hydro Units**
  - Weekly Peak Shaving with minimal daily scheduling
  - Inputs for each month for each historical weather year modeled

- **Solar – Model with Hourly Profiles**
  - 1,335 MW by 2026
  - Based on locations across the service territory, hourly irradiance data is pulled from the NREL database and profile development using SAM.
    - Data is available from 1998-current
    - Use daily solar data from 1998 to current profiles to fill in from 1980 – 1998 based on solar to load correlation.
      - Example: For January 1, 1980, determine closest matching load day from this day and the 1998 – 2021 period only examining Dec 31 – January 2 range of each year. Once this match is determined used that day's solar profile.

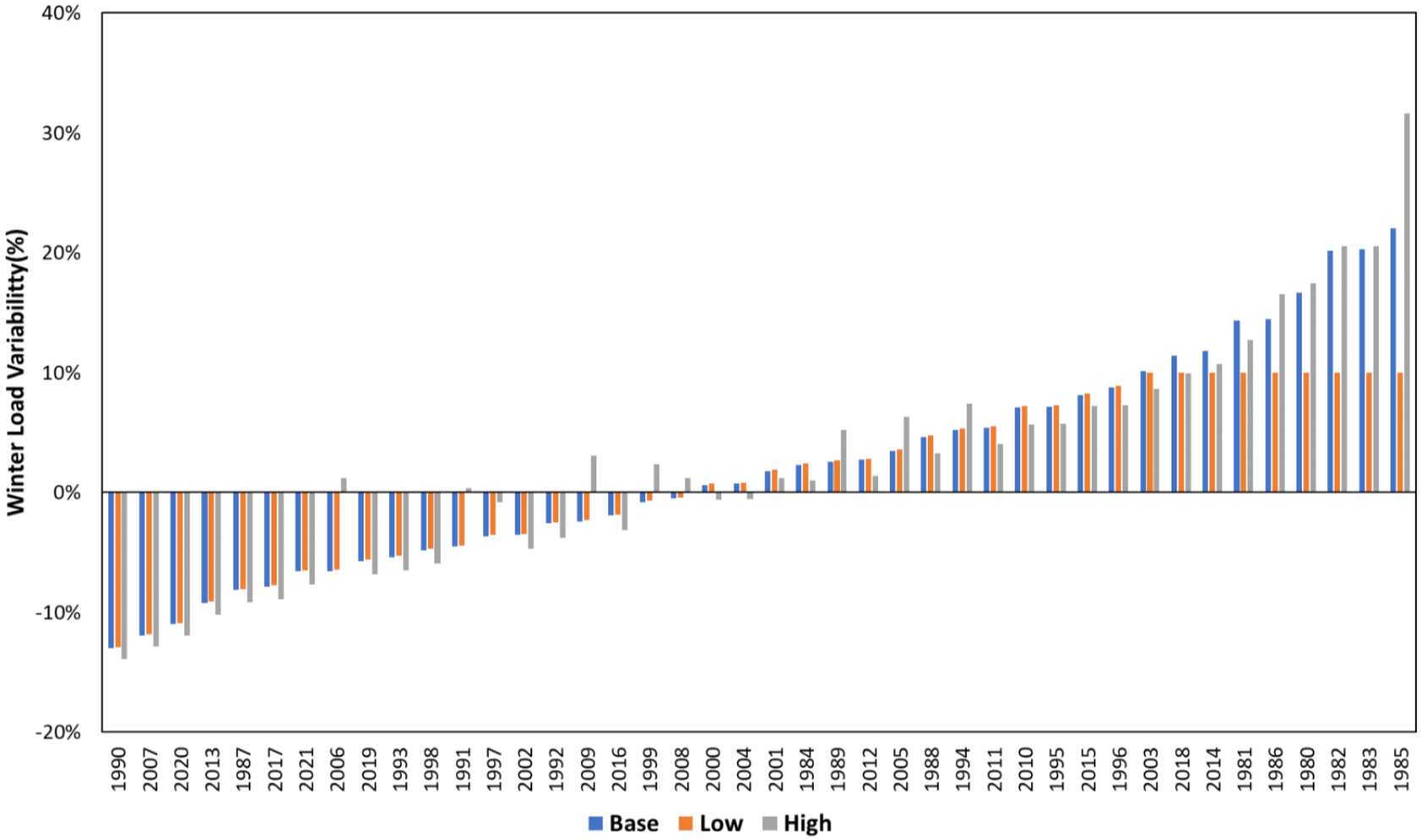
Solar Sites Modeled



Additional Sensitivities

- Island Case
- High/Low Cold Weather Load Response Case
  - Representative of extreme bookends
  - High Load response case assumed the max winter variability recently seen in ERCOT during Winter Storm Uri
  - Low Load response case capped the winter peak load at the highest historical winter load peak; assumes 100% saturation at 2015 loads which was 10 degrees above the coldest day over 40 years

Load Response Sensitivities
Peak Winter Load Variability by Weather Year



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Planning Reserve Margin Results

Case	Winter Reserve Margin for 0.1 LOLE(%)
Base	20.1
Island	43.4
High Load Scenario	22.2
Low Load Scenario	15.9

Existing Solar Winter Capacity Value = 2%

Month	LOLE % of Total
Jan	62.4%
Feb	6.4%
Mar	4.6%
Apr	0.0%
May	0.0%
Jun	0.9%
Jul	1.8%
Aug	0.9%
Sept	0.0%
Oct	0.0%
Nov	0.0%
Dec	22.9%
Winter	96.3%
Summer	3.7%

Summer Constraints

- **While winter is the binding season, a summer reserve margin of 15% results in ~0.015 summer LOLE.**
- **Because of this, it is recommended that a summer reserve margin of 15% be maintained as a secondary constraint.**

ELCC Analysis for New Solar and 4 Hour Storage

Winter ELCC Methodology Details

- Start with System at approximately 0.1 LOLE
- Add storage and/or solar tranche to system
- Add load (negative perfectly available capacity) until LOLE return to the target.
- ELCC is the load added divided by the nameplate of the resource/portfolio
- Storage modeled with 3% forced outage rate

ELCC Portfolio Matrix to be Evaluated

	Incremental 4 Hour Storage MW			
Incremental Solar MW	50	300	550	800
100	x	x	x	x
600	x	x		
1,100	x		x	
1,600	x			x

Capturing solar and battery together ensures any synergistic value of the two resources is considered

Winter ELCC Results

Incremental Solar	Solar Average ELCC
MW	MW
100	2.7%
600	0.7%
1,100	0.5%
1,600	0.5%

Incremental Storage	4 Hour Storage Average ELCC	4 Hour Storage Average ELCC	4 Hour Storage Marginal ELCC	4 Hour Storage Marginal ELCC
MW	Conservative Operations on Extreme Days	Assumes Economic Arbitrage	Conservative Operations on Extreme Days	Assumes Economic Arbitrage
50	100%	93.4%	100%	93%
300	100%	90.9%	100%	90%
550	99.0%	88.4%	98%	85%
800	94.8%	85.9%	88%	80%

-Includes any synergistic value of solar and storage
-Economic arbitrage storage results represent a curve fit across all the simulations given the varied dispatch across penetration levels

Questions? Please use the Chat function

DESC IRP Stakeholder Advisory Group Meeting #10

III. 2023 IRP Inputs

2023 IRP Inputs

- New Legislation
- Peak Demand and Energy Forecast
- Load Forecast Scenarios
- Commodity Fuel Price Inputs
- New Resources
- Candidate Resource Options
- *Discussion*

New Legislation

Inflation Reduction Act ("IRA")

- Extends the ITCs and PTCs for renewable technologies for at least ten years
- Expands the qualifying technologies
- DE currently awaiting additional IRS guidance
  - ITC transfer options
  - Normalization requirements
  - Bonus credits for energy communities
- DESC must layer in the impact of IRA or its 2023 IRP will likely be rejected
- Plans to model PTCs for its generic solar & ITCs for battery storage
  - SC solar has better capacity factors and lower capex than VA solar

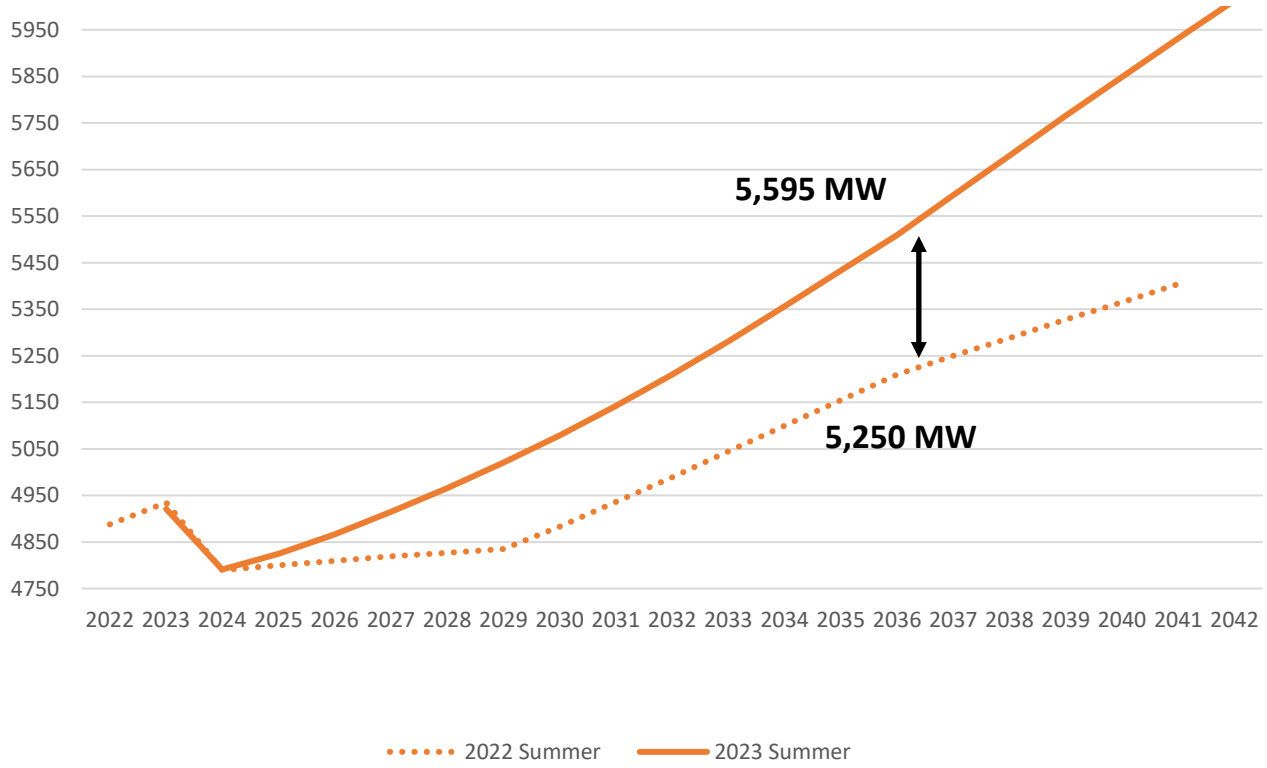
Infrastructure Investment and Jobs Act ("IIJA")

- Actively assessing potential grant opportunities under the IIJA
- Process of identifying and pursuing IIJA funding opportunities will continue over the programs' five-year time horizon
- With planning currently at a preliminary stage, no specific funding opportunities are being assumed by DESC in its 2023 IRP

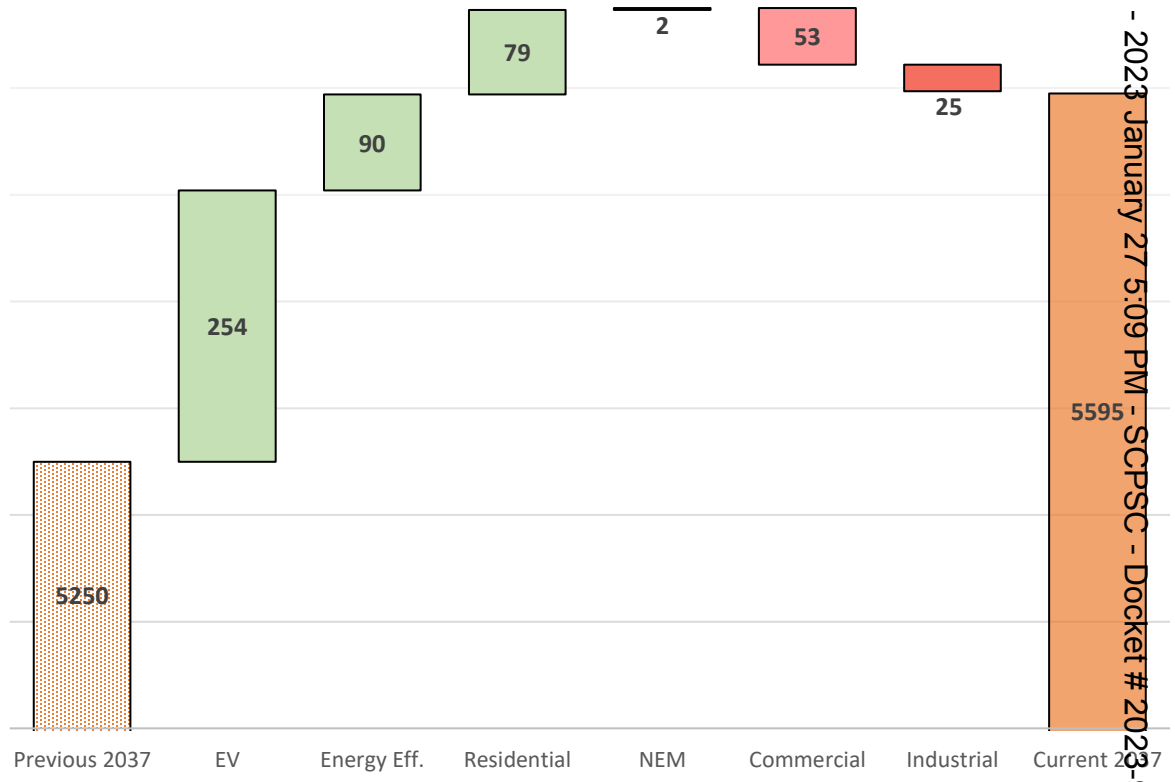
DESC Load Forecast

Peak Demand and Energy Forecast

Gross Summer Peak Forecast (MW)



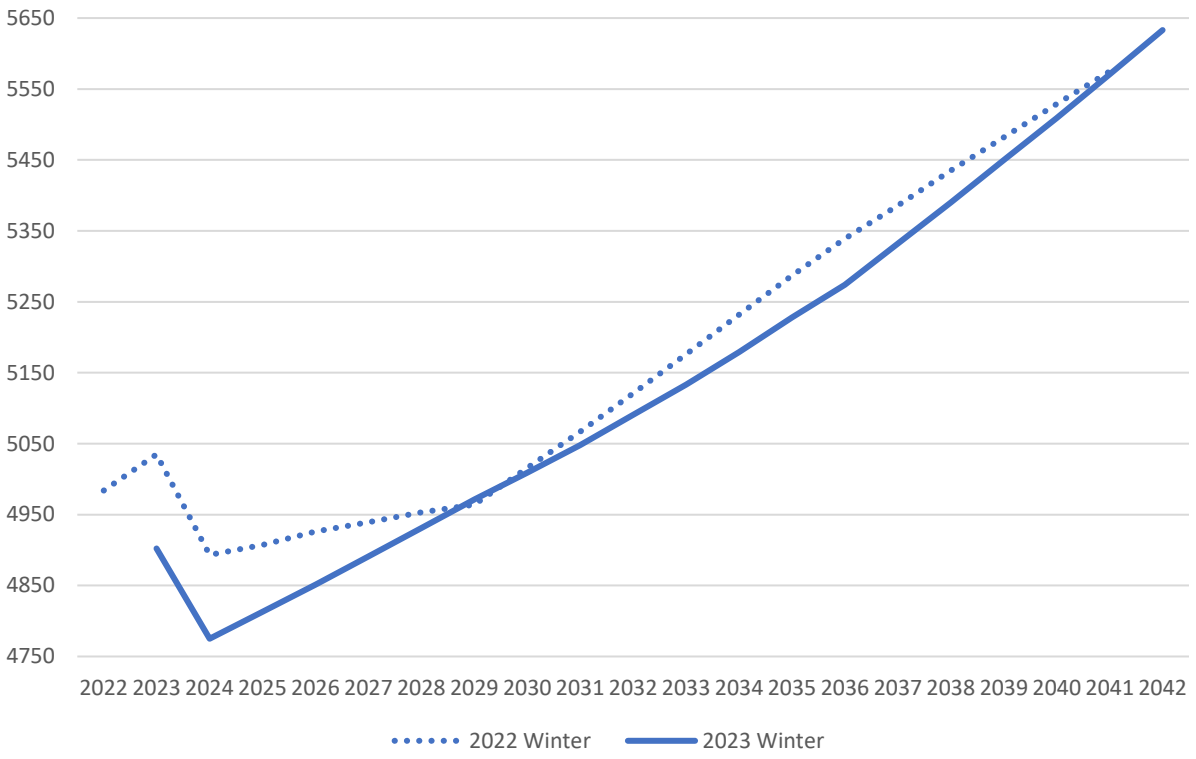
2037 Peak Forecast Comparison



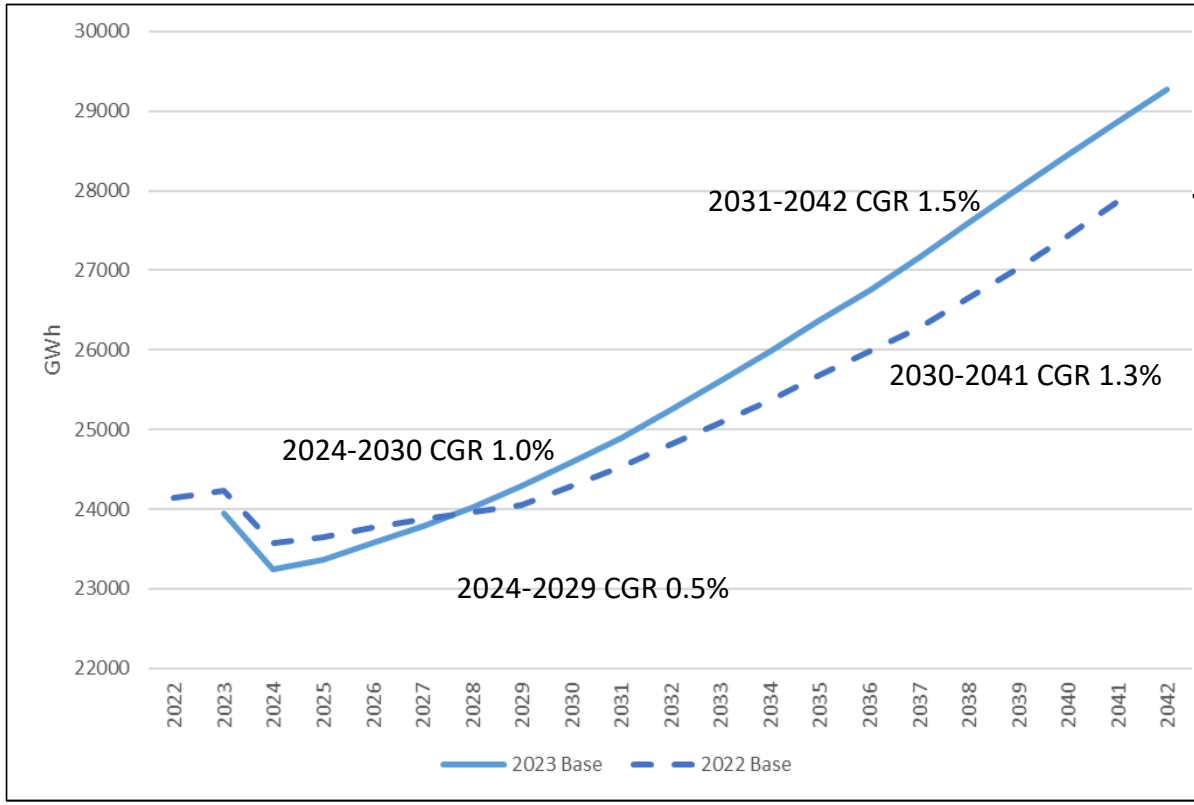
DESC Load Forecast

Peak Demand and Energy Forecast

Gross Winter Peak Forecast (MW)



Energy Forecast (GWh)



Load Forecast Scenarios

2022 IRP Update Load Forecast Scenarios

- Base Load Forecast - Updated 2022 Load Forecast
  - **Includes DSM 1%** total energy savings as % of previous year's retail sales
  - Adjusted for EV Forecast – 2022 Guidehouse Baseline
- Low Load Forecast – 0.5% reduction in growth rate from Base Load Forecast
- High Load Forecast – 0.5% increase in growth rate from Base Load Forecast

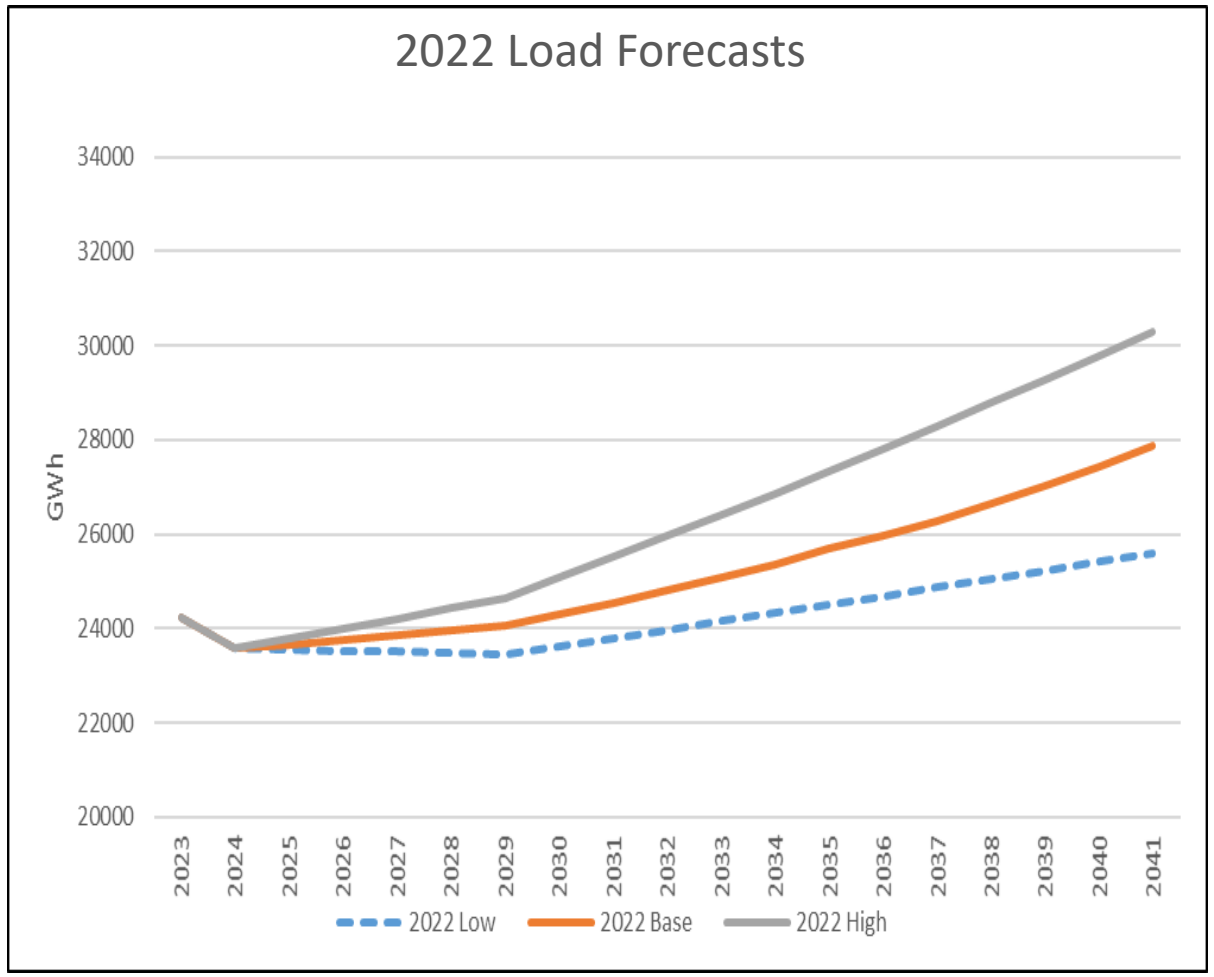
2023 IRP Load Forecast Scenarios

- Base Load Forecast - Updated 2023 Load Forecast
  - Includes 2023 DSM Potential Study **0.51%** total energy savings as % of previous year's retail sales
  - Adjusted for EV Forecast – 2023 Guidehouse Baseline
- Low Load Forecast – 0.5% reduction in growth rate from Base Load Forecast
- High Load Forecast – 0.5% increase in growth rate from Base Load Forecast

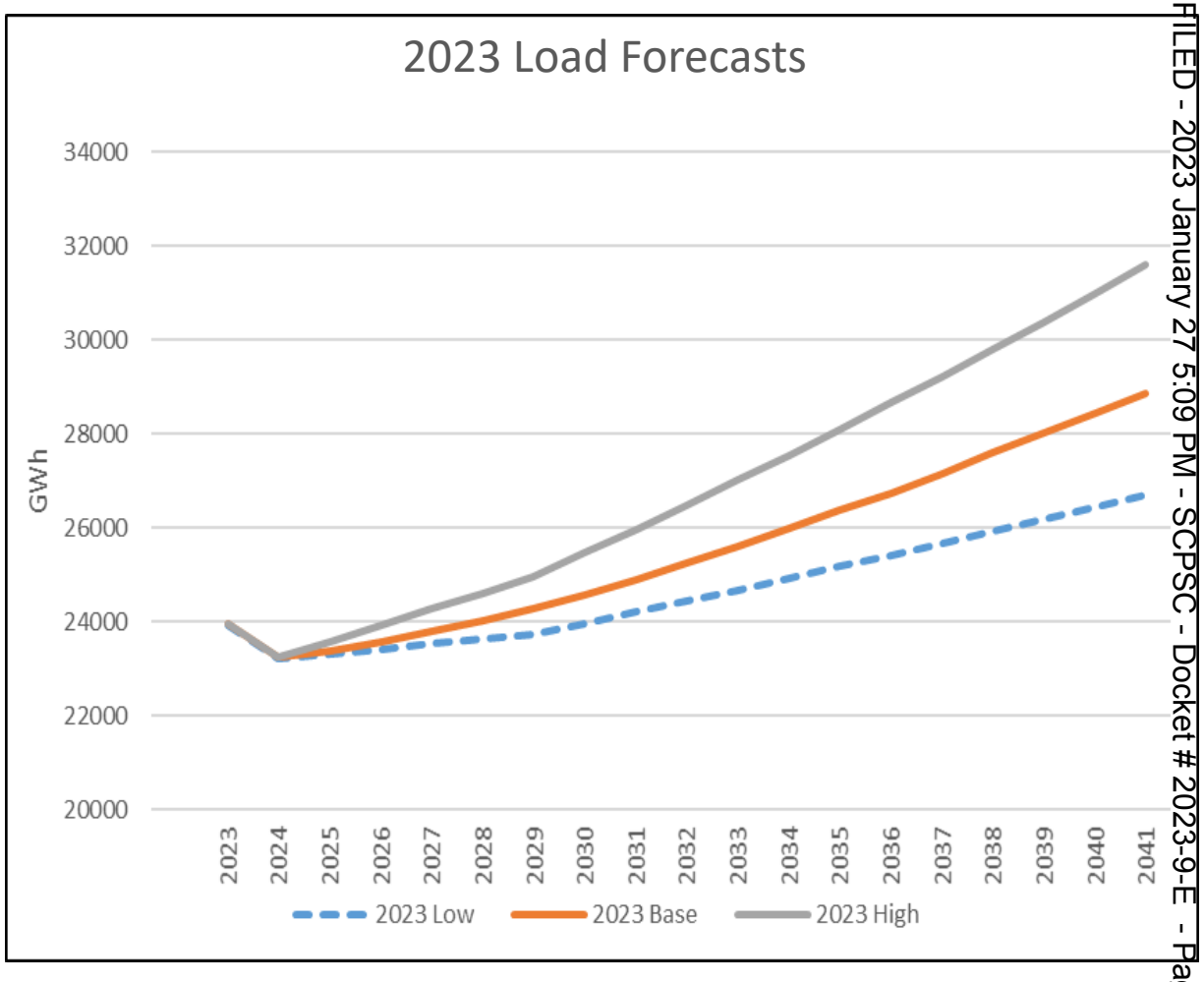
ORS recommended in its report on DESC's 2021 IRP Update that DESC develop a reasonable methodology for predicting a "wide but plausible" range of future loads for the 2022 IRP Update and begin to use that range of load forecasts in its sensitivity analyses.

Load Forecast Economic Scenarios

2022 IRP Update Economic Scenarios (GWh)



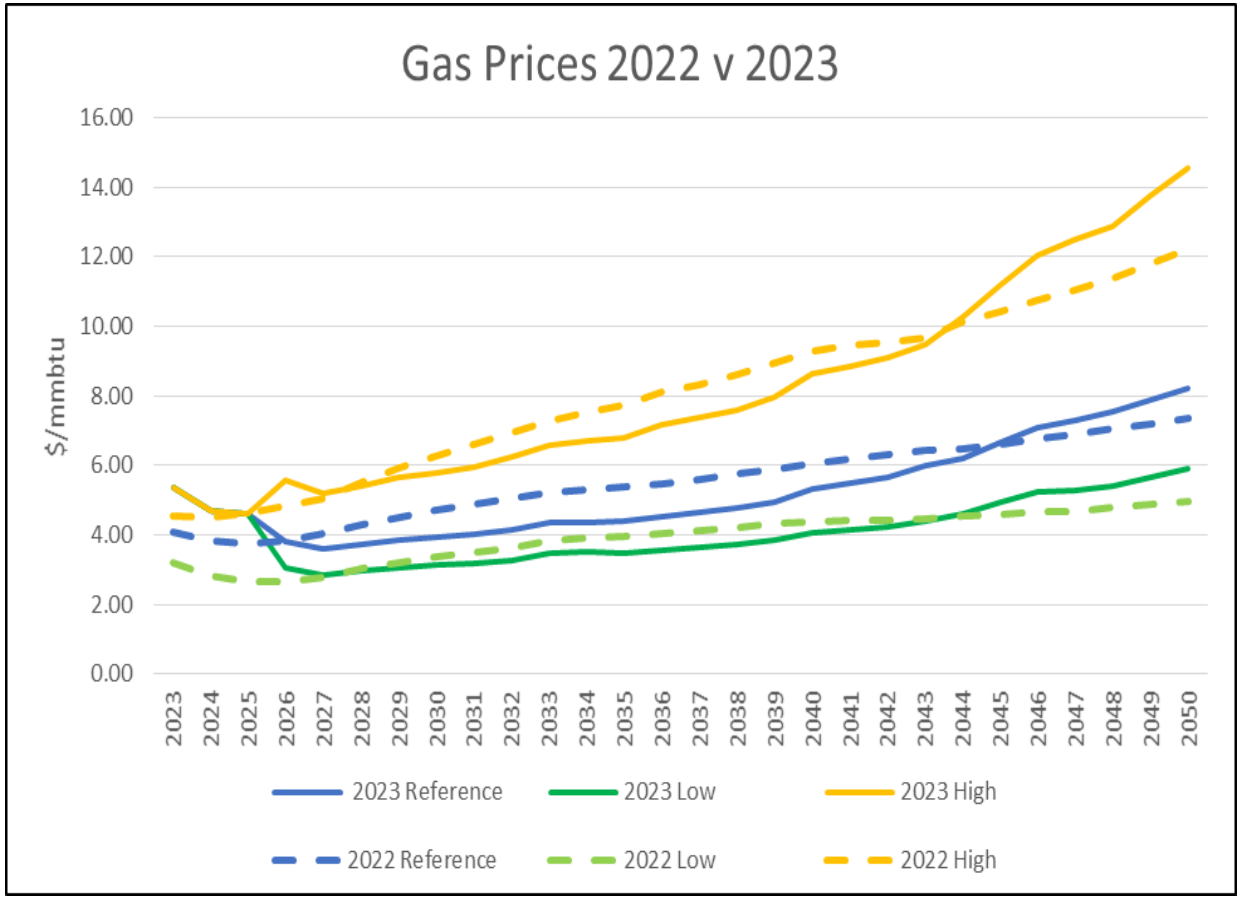
2023 IRP Economic Scenarios (GWh)

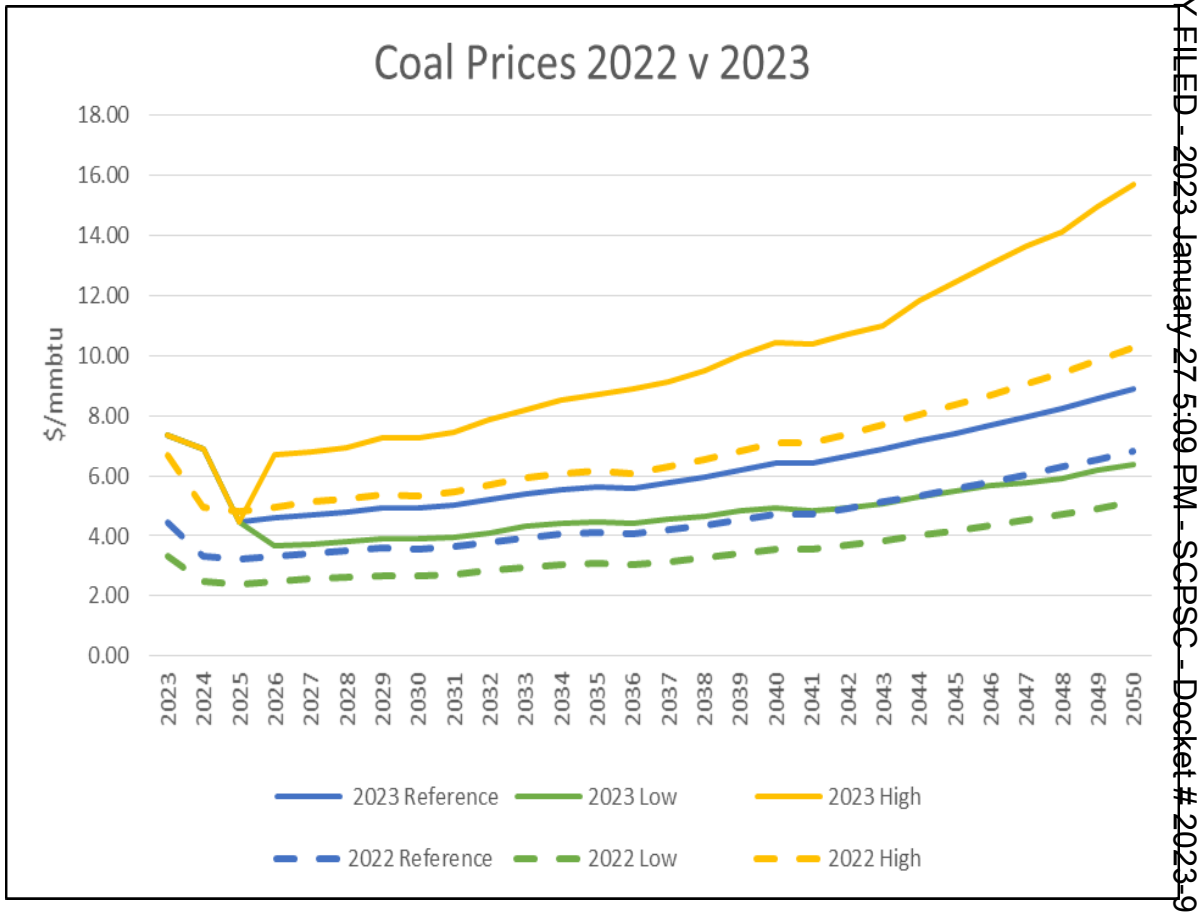


Supply-Side Inputs

Commodity Forecasts 2023 vs. 2022

Gas and Coal



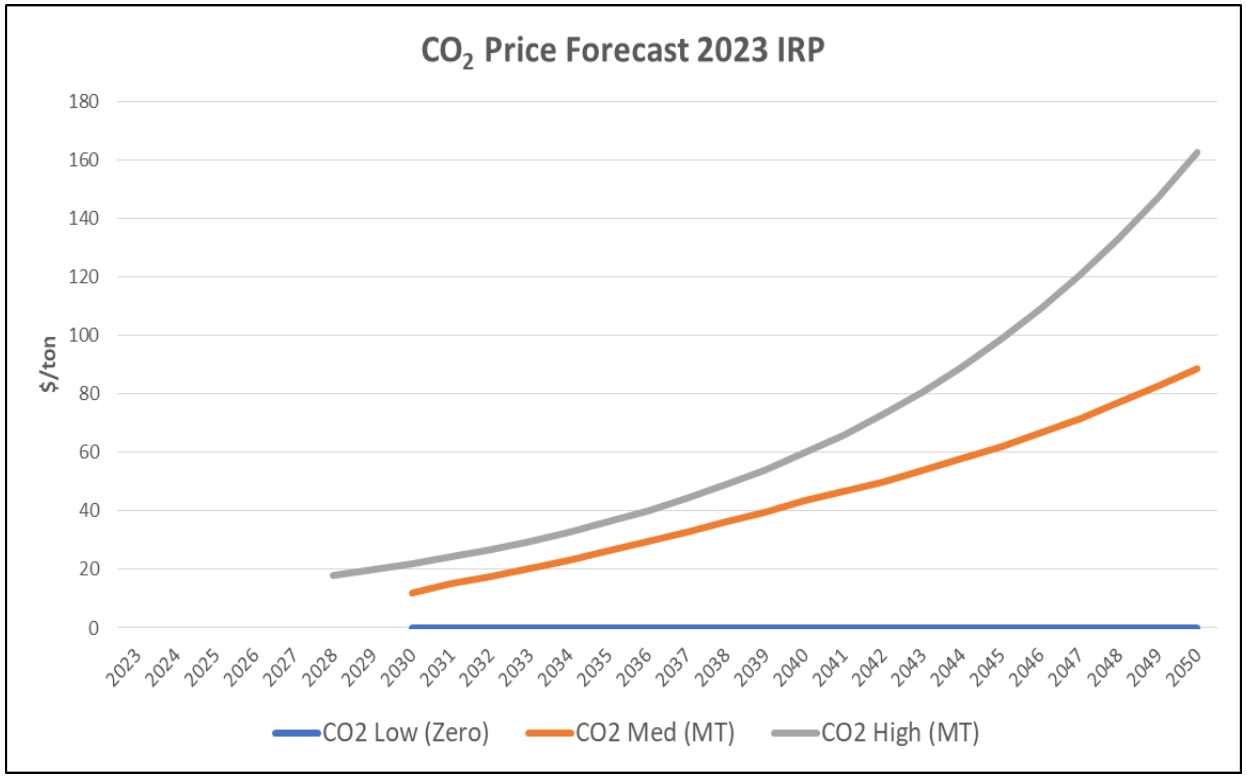


The NYMEX HH gas price and the pricing from DESC coal markets inform the first three years of the reference price forecast. The IHS North American Power Market Outlook for NG and CAPP coal inform the remainder of the medium gas and fuel price forecast.

Supply-Side Inputs

Commodity Forecasts 2023 vs. 2022

CO_2 Price Forecast



- 2022 & 2023 Low CO_2 Price: $0/ton
- Medium –IHS US Power Sector Forecast
- High – 150% of the Medium forecast starting in 2028
- ORS noted the following in its Coal Plants Retirement Study comments:
  - DESC's Base and High CO_2 sensitivities are generally lower and begin later than other utilities analyzed by ORS
  - DESC's Base and High CO_2 sensitivities are lower than recently proposed CO_2 legislation

ORS recommended in its Coal Plants Retirement Study comments that DESC review the CO_2 forecasts further by comparing to other utility forecasts prior to conducting the 2023 IRP.

New Resources

Shared Resources

- Two or more utilities with concurrent needs jointly build a larger Combined Cycle
  - Due to economies of scale, participating utilities would see lower costs per kW and per kWh
- Shared Project would anchor a NG pipeline project bringing much needed NG into the SC Low Country
- New and additional gas availability is required for economic development opportunities for SC
- Inform DESC ELG project development at Wateree if unsuccessful with permitting new resources
- Supports the retirement of coal plants

DSM as a Resource

- DESC is required to include DSM and purchased power as a resource option in the 2023 IRP
- ICF completed a comprehensive evaluation of DR programs for both residential and commercial customers with an emphasis on decreasing the winter peak.
- Analysis bundled all programs by sector
  - Two programs proposed to be modeled as selectable DR resources in the 2023 IRP
    - Residential TOU
    - Smart Thermostat Opt-In

Supply-Side Inputs

New Resource Data

Unit Description	2022 IRP Update Capital Cost ($2022/kW)	2023 IRP Capital Cost ($2022/kW)
New 1x1 Combined Cycle	1857	1452
New 2x1 Combined Cycle	1437	1163
New Shared CC		1163
New 3x1 Combined Cycle	1189	941
New CT Aero 2x	1305	1898
New CT Frame 1x	725	1384
New CT Frame 2x	725	1135
New Small Modular Reactor	6488	6490
New Solar	1226	1241
New Solar PPA	1226	1241
New Battery 4 hour	1387	1457
New Off-Shore Wind	4323	4323

Working with Project Construction Group for updated costs

Questions? Please use the Chat function

DESC IRP Stakeholder Advisory Group Meeting #10

IV. Transmission Impact Analysis

2023 Transmission Impact Analysis Request DRAFT

- Case 1 – Canadys Site:
  - Wateree is retired on December 31, 2028 and replaced with a 100 MW ESS at the Wateree site and a 262 MW Urquhart Frame CT. This resource combination could be augmented by utility-scale solar generation. Williams is retired by 12/31/2030 and a new Shared Resource is constructed at the former Canadys site. DESC would receive 50% of the new 1,325 MW natural gas-fired 2x1 combined cycle generator constructed at Canadys and receive that energy on the DESC transmission system. Also include a new 50 MW Aero CT at the Bushy Park.
- Case 2 – Hampton Site:
  - Also includes the Wateree Replacements. Williams is retired by 12/31/2030 and a new Shared Resource is constructed at the new Hampton site. DESC would receive 50% of the new 1,325 MW natural gas-fired 2x1 combined cycle generator and receive that energy on the DESC transmission system. Also include the addition of the Bushy Park Unit.
- Case 3 – Diverse Locations:
  - Also includes the Wateree Replacements. Williams is retired by 12/31/2030 and a new 1X1 combined cycle generator is constructed at the former Canadys site. This new CC is placed into commercial operation by 1/1/2031. Also include the addition of the Bushy Park Unit. Also, Santee Cooper will build a new 1X1 combined cycle generator at the Hampton site and place it into commercial operation by 1/1/2031. The 1x1 CC has a winter rating of 650 MW.

Questions? Please use the Chat function

DESC IRP Stakeholder Advisory Group Meeting #10

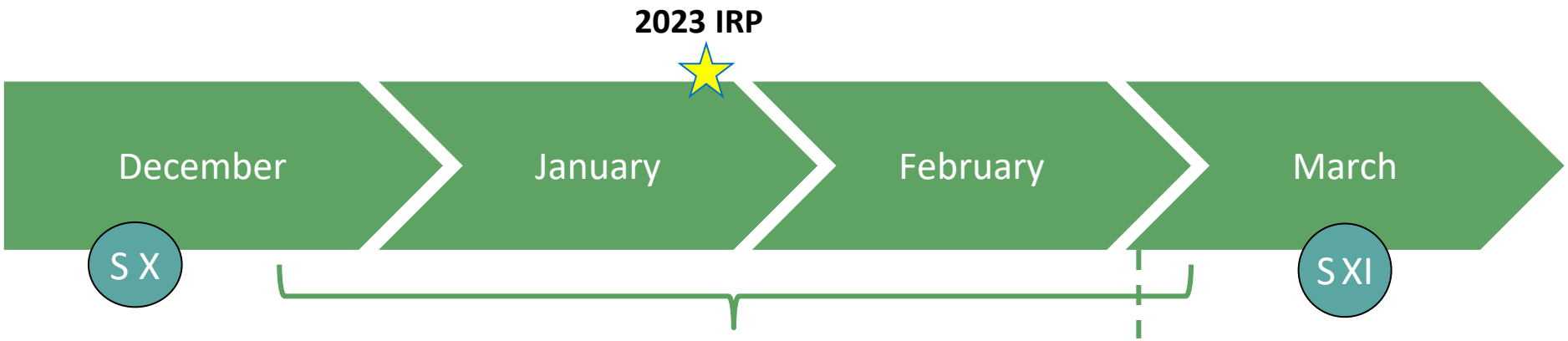
V. Plans for Session XI and Next Steps

Dominion Energy®

Plans for Session XI and Next Steps

- Planning for Session XI
- Session X Homework
- *Discussion*

Planning for Session XI



2022 IRP Update Procedural Schedule

Session X HW

IRP Advisory Group Session XI:

- Report on Stakeholder Feedback
- 2023 IRP Key Takeaways and modeling results
- Identify short- and long-term goals for future stakeholder engagement

Session X Homework

General Feedback

1. What topics should DESC add to the agenda at Session XI or as part of a future Stakeholder Session?

2023 IRP

2. Are there any aspects in particular from the 2023 IRP that DESC should discuss at session XI?

IRA

3. Are there any additional considerations/suggestions for modeling the IRA in future IRPs?

Priorities for 2023 DECS IRP Stakeholder Advisory Group

4. What are the top priorities DESC should collaborate with stakeholder on during 2023?

Request HW responses by March 1, 2023

Discussion - Please “Raise Hand” in the Chat

Stakeholder Website Overview

Supplemental materials and QA support documents

Registered users can submit on-topic Questions to DESC

Published QA can be viewed by public

Stakeholder Meeting Materials posted here before or shortly after Working Group Sessions

https://www.DESC-IRP-Stakeholder-Group.com

Email DESC-IRP-Group@crai.com with questions about the website or if you have content to share with the Stakeholder Group